EMPOWERING NEXT GENERATION INNOVATORS AND INNOVATIONS

EMPOWER

DEFEND

INNOVATE

AFWERX

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> ❝ All progress is experimental. ❞
> JOHN JAY CHAPMAN

AFWERX

ΛFWΞRX

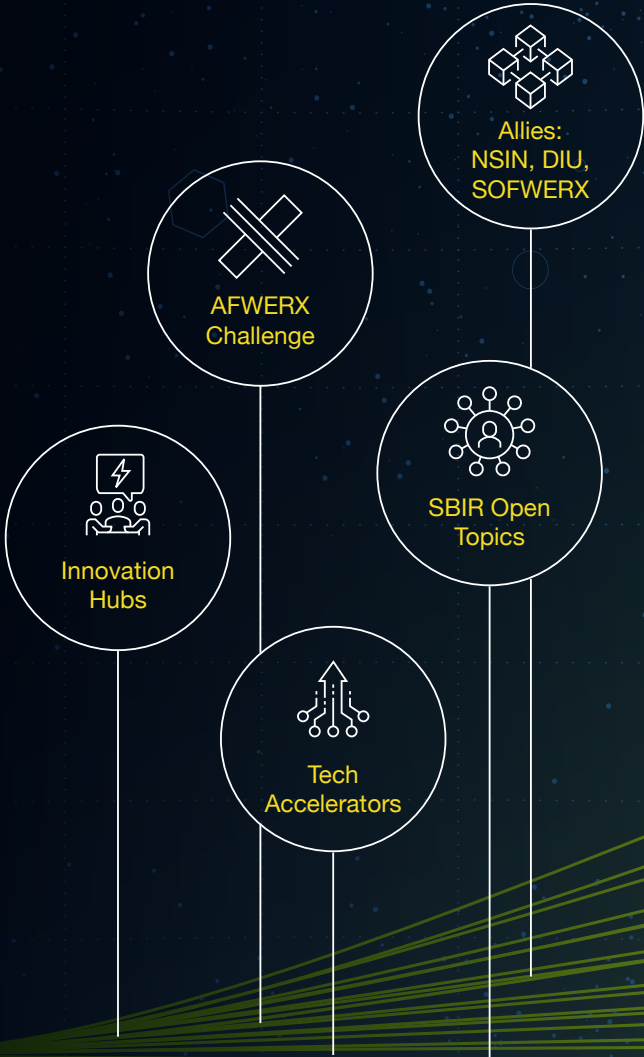> Your path to solving innovation demand with innovation supply and increasing Air Force agility

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WELCOME! We created this book to provide insights into the first two years of our AFWERX mission operations (2018–2019): how we began, how we evolved, and what we have learned. We would have finished writing it sooner but we needed to balance this "reflection" effort with "getting stuff done" for our warfighters. Within these pages, we hope to provide you with useful views of our innovation culture and structure that have produced results on diverse focus areas, such as:

➡ Artificial Intelligence
➡ Driving Culture Change
➡ Microelectronics
➡ New Helmet Technology
➡ Leveraging Venture Capital
➡ VR & AR for Operations
➡ Perimeter Security
➡ Advanced Pilot Training
➡ Base of the Future

When trying to explain AFWERX, we acknowledge that any model is incomplete (by necessity). Indeed, it is the model's simplifications that provide its usefulness. For our AFWERX structure, we offer a deceptively simple-looking "supply and demand" chart that captures all of our capabilities. In reality, we are a dynamic system with multi-directional connectivity flowing across numerous innovation efforts. Our approach draws upon numerous innovative thinkers whose influences span the ages, including Socrates, Plato, Aristotle, Confucius, Adam Smith, and Alexis de Tocqueville. In our most basic conception, AFWERX helps uncover innovation desires (demand) and matches them with innovation creation capabilities (supply) to help create new capabilities.

The diagram on the previous page highlights the general position of the capabilities within our overall AFWERX system. If the labels look a bit cryptic, fear not! They are explained in the chapters ahead. Ultimately, all of our capabilities contribute to creating warfighter solutions.

In the chapters that follow, we offer you some of our key highlights, lessons learned, and other interesting ideas that we wanted to share, based upon our AFWERX capability leaders' experiences within their various efforts. Like our capability leads, our writings have their own style, with notable variations in length, tone, and emphasis. These differences reflect the diverse talent that is within our AFWERX Common Mind. The experiment of AFWERX is many things; uniformity is not one of them.

The book is structured in the following way: Following the AFWERX Overview section, the order of the chapters follows the order of our capabilities in diagram; Part One focuses on how we uncover ideas and opportunities to benefit the warfighter;

Part Two focuses on how we take those ideas and opportunities and work to assess the opportunity to develop them in preparation for transition;

Part Three focuses on how we then support the transition of the prototypes into the USAF for the warfighter. AFWERX is merely a facilitator and supporter of this process. It is the hard work of the many USAF team members that execute the transition. Without them, we would not be able to make any impact.

Brian E. A. "Beam" Maue, PhD
Cofounder, AFWERX

"All progress is experimental."

Overview of AFWERX

How AFWERX was Formed, a Brief History

Mark "Daggers" Ingram /// Brian "Beam" Maue

AFWERX

> Imagination is more important than knowledge.
> Knowledge is limited.
> Imagination encircles the world.
>
> ALBERT EINSTEIN

When we innovate, we create alternate realities. Whether an idea advances as a sketch on the back of a napkin, or because a prototype produces new data, the innovation process advances our thoughts, actions, and future options in ways never before known. Each experiment reveals new insights to follow or warnings about what not to follow.

The Air Force continued to expand this experimental mindset with a single-tasking from the Vice Chief of Staff of the Air Force (VCSAF) in February 2017:

Explore what an Industry Storefront and Innovation Organization could look like for the Air Force, similar to what USSOCOM had accomplished with their SOFWERX Innovation Hub.

It was this moment when the foundation of AFWERX began to take shape, and it is here in this book where we begin offering our *Lessons Learned & Insights Shared*.

The earlier you can establish an innovation effort's structure, authorities, and responsibilities, the smoother your multi-stakeholder innovation efforts will become.

The raw materials for AFWERX were already being laid into blueprints in the Spring of 2017. They were coordinated and refined between multiple Air Force organizations over the span of approximately four

months in 2017 and under VCSAF direction, AFWERX was approved to stand up on July 5, 2017 (internally, we would be publicly announced by Secretary Wilson later that month).

There were 11 iterations of AFWERX at the conceptual level, with each incorporating, scaling, and adopting new bits and pieces from many existing innovation efforts. The structure of AFWERX was created to link innovation efforts ranging from a more individualistic focus to one focused on Air Force Innovation at large. Capabilities were connected where it made sense, scaled when appropriate, and established when gaps were identified. There was not a predefined answer, but there was a willingness to flexibly integrate innovation and this approach is one that any future innovation effort could (and in our humble opinion, "should") attempt to follow.

This process created the blueprint for AFWERX, which has largely been followed for over two years. While capabilities have been added as new tools and other innovative approaches are identified, the foundational building blocks have remained in place, and models are merely adapted as new lessons are learned.

Our construction story and metaphor also include that, despite having a solid blueprint, one of the earliest lessons learned from the creation of AFWERX was that

the builders tasked to construct the building need well-defined relationships. When plumbers do not talk to carpenters, and electricians do not work with masons, you may wind up with a bathroom where the sink drain is in the wrong spot, or where exterior lighting cannot be attached to a brick wall without hampering structural integrity.

AFWERX was no different. We began in the summer of 2017 as a Coalition of the Willing, similar to how many past innovation efforts have started. A four-person steering group, with membership from four separate Air Staff offices, was identified to lead the mission. Three other organizations—the Air Force Strategic Development Planning & Experimentation (AF SDPE) office, the Air Force Research Laboratory (AFRL) and the US Air Force Warfare Center (USAFWC)—were tasked with aiding in the execution of AFWERX, alongside contracted support from the Doolittle Institute and Virginia Tech Applied Research Corporation (VT-ARC). This created a model in which roles and responsibilities were not crisply defined, lines of authority were subject to being crossed, and no single individual was ensuring that the building blocks were aligned to create a single cohesive foundation that could support a tower of innovation activities.

This model resulted in a great deal of inefficiency between the builders of the different pieces. It took nearly six months to reset this structure with a signed AFWERX Charter that established a single AFWERX Mission Lead. Although the many unstructured efforts may have collectively sharpened the various AFWERX focus areas, that approach to innovation creation came at a cost of second and third-order effects that were not the most optimal.

For example, execution models between Air Force organizations that had been established with handshakes could later go a bit sideways as people left various offices. Similarly, collaborative mindsets have, at times, devolved to competition-centric, "who is right" mindsets that work against progress. Less than clear roles and responsibilities caused unnecessary issues between the various organizations that we worked with, stifling the innovative spirit. Any future Air Force Innovation effort needs structure and well-defined relationships early. Failing to do so can set the organization back months as roles and decisions are slowly sorted out while operations proceed.

LEARNING FROM OTHERS

Many Air Force innovation organizations had already come and gone before us. Past organizations like the Battle Labs and AFRL Tech Connect left valuable lessons learned. Present organizations like the Defense Innovation Unit (DIU), the Rapid Capability Office (RCO), Airmen Powered by Innovation (API), AFRL, the Center for Rapid Innovation (CRI), and AF SDPE were actively pursuing innovation missions for the DOD. Still, other contracted innovation hubs run by intermediaries like SOFWERX, Wright Brothers Institute (WBI), Doolittle Institute, Griffiths Institute, and VT-ARC were actively working with the Air Force and pursuing Tech Transfer and innovation missions in support of DOD Innovation. These organizations would inform and help shape the organizational construct of AFWERX.

Aside from these organizations tackling the innovation mission, something new and exciting was happening with innovative and entrepreneurial members of the Air Force. A few had started grassroots initiatives such as base-level, innovation Spark Cell groups, partnerships with experienced commercial Technology Accelerator businesses, and Airmen competitions geared toward bringing ideas from the field to the front of senior

decision-makers. They were willing to join the "fusion of capabilities" that was forming AFWERX.

With all of these existing pieces, creating a single organization to align them all meant that each organization and individual had to be flexible, and the Air Force at large had to be flexible with its vision of what the organization would look like. Standing up a new organization with a new mission that cut across all three domains—Air, Space, and Cyberspace—meant that flexibility had to be at the center of discussion from the very beginning.

Nothing happens overnight. Although it may sound paradoxical, Caesar Augustus's advice of "Make haste, slowly" would also describe part of our mindset as we tried to remain flexible and learn from others (and ourselves) while executing the AFWERX mission.

PERSONAL RELATIONSHIPS
Great for Building Trust, Poor for Execution Models

It is almost instinctual. Whether we find ourselves in a new place, with new people, or tackling a new problem, the first thing we often do is gravitate to the things we find familiar. In our personal lives, this can be as simple as trying to find a familiar restaurant chain while on vacation, only talking to friends at social gatherings, or trying to solve new problems using the ways we have solved other problems in the past. While you can argue that this is often a great way to begin, there comes a time when you start to understand that to truly drive change—in your personal life, your relationships, or your experiences—what seems comfortable and easy may not always be the best option. Innovation is no different.

When AFWERX was launched, it was truly a Coalition of the Willing. No one had any experience establishing an innovation organization hoping to drive change for

over 680,000 people. Who could? The first wave of our innovation coalition was simply a handful of individuals, with unique experiences, relationships, and desires, all working towards a common goal. We had no budget of our own, no contract vehicles of our own, no people of our own, and we were thrust into a space where many others had tried and failed.

As you may expect, many of our first decisions and actions leveraged personal relationships. The reality we faced was simple—individually we may have proven ourselves capable of handling minor league challenges well, however when collectively called upon as a group to affect change like a well-oiled major league club, our lack of collective experience with producing results left many with reasons to think that we were little more than rookies. Our training was questioned, our ability to play well with others was untested, and while one player may be trusted by some, others were unknown.

We were all in a new place and we gravitated to who and what we knew. We found the people we played ball with in college—who knew us and could speak for us. We used these relationships to earn our teammates' trust. As you may expect, this is what we worked with for the first few months. Eventually, we started to be accepted as the rookies who seemed likely to stick around, and while our personalities may not always have meshed, we were all playing well together. The personal relationships we had brought to the major league allowed us to build trust and had kept the team moving forward. But as we would soon see, this was only half of the challenge. The larger issue was that we had come with nothing of our own—no funding, no contracts, no manpower billets. We were the replacements who had been borrowing our teammates' bats, cleats, and gloves. That approach worked—until it didn't.

Many of AFWERX's first contracts were built on trust—created by people helping former coworkers out, offering

flexibility because they trusted one individual person. The individual manpower was provided for free and projects were getting done because of phone calls and handshake agreements. Over time, these contracts, manpower, and flexibility options began to wane. As we tried to take the next step toward sustaining our organization, we encountered challenges. While it had been ok to loan one player a bat or a glove, often the original players did not want to offer their resources up to "everyone" (our ecosystem of clients had grown). Our option to borrow a glove disappeared. A sense of uncertainty returned.

We had been in the game for a while, but just as we were starting to hit our stride, receiving our own funding and building out an organization with our own manpower, our contracts were beginning to expire and many of our original supporters could not or did not support our scaled mission. The magnitude of this challenge was unforeseen, but it should not have been. We had been in a honeymoon phase, and now we were not. We were mid-season, and our teammates needed to stop loaning us equipment. The rest of the season was a mix of good and bad. We were earning wins, such as by helping the Air Force break vendor lock and showing that it was possible to cut acquisition timelines. At the same time, our losses were notable, with potential stop-work situations presenting themselves at what sometimes seemed like a weekly basis.

AFWERX would not be where we would be today without personal relationships...but we could potentially be further if we had been less reliant on them from the beginning. In any venture you take, remember that it is ok to use personal relationships to build trust, but if you hope to scale and become your own entity, you must always be thinking of what's next and be willing to step out of your comfort zone to ensure you will be ready to take over and continue down a winning path if the day comes when all your personal support goes away.

EARLY STRUCTURE AND FINANCING OF AFWERX

In the summer of 2017, when senior leaders publicly established the Air Force priority of "Drive innovation to secure our future," the AFWERX mission was made public as well. Vice Chief of Staff General Stephen Wilson and Lieutenant General J.D. Harris shepherded our first two years as we created, organized, and developed innovation capabilities to increase warfighter agility (agility = speed with options).

The initial operating structure defined the Deputy Chief of Staff for Strategic Plans and Requirements (AF/A5R) as the lead for the AFWERX-DC hub and the United States Air Force Warfare Center (USAFWC) as the lead for the helping set up the AFWERX-Vegas Hub. The AF SDPE office was approved to put the innovation hubs under existing Partnership Intermediary Agreements (PIAs). At the time, AF SDPE funding was provided through AFRL/FM channels and the PIAs that were to be used were executed through AFRL. As a result, the first two years of AFWERX operations (FY17 and FY18) were funded as AFRL Corporate Requirements from the AFRL Headquarters budget.

This initial joint AF/A5R-USAFWC operating structure was replaced a few weeks later in July 2017 with a four-member steering group with membership from four other Air Staff Offices representing Intelligence (AF/A2), Strategic Requirements (AF/A5), Cyberspace & Information (AF/A6), and Planning & Programming (AF/A8) offices. This steering group led the entire AFWERX Mission and reported directly to the VCSAF. Funding for AFWERX remained an AFRL Corporate Requirement, but all Operational Command (OPCON) functions resided with the Steering Group. Can you guess why some of our actions may have seemed a bit scattered?

The four-member steering group was replaced in March 2018 under a new Secretary of the Air Force (SECAF)-signed charter appointing a single AFWERX Lead reporting through AF/A5/8 to the VCSAF. Funding for AFWERX remained an AFRL Corporate Requirement, but all operational functions were transferred to the AFWERX Lead. As the AF/A5/8 office split, AFWERX moved under AF/A8 as a division office—AF/A8I.

In FY17, as an AFRL funded Corporate Requirement with all funds allocated to organizational stand-up, we did not fund any projects. This began to change in FY18 when a limited amount of funds were provided for projects and other efforts. Funds were used to host the first AFWERX Fusion Xperience and Site Security Challenge—a challenge which had been requested by the VCSAF, and provided prototyping and transition resources for Spark Tank finalists as well as a limited number of base-level, Spark Cell projects.

In FY19, AFWERX received its own funding line in the Technology Transfer Program Element (PE). Although

funding support from AFRL officially ended, the relationship evolved and AFRL continued to provide financial management of the funds on behalf of the AFWERX Lead who maintained operational control of the mission and an AFWERX Resource Manager who bridged the relationship between AFWERX and AFRL. The majority of FY19 funding supported core AFWERX operations, and once again a limited amount of funds were provided to pursue innovation through our hubs, virtual tools, technology accelerator, base-level Spark Cells, and MAJCOM innovators capabilities. AFWERX has also partnered with many other organizations and has often leveraged or helped execute SBIR/STTR funding, Squadron Innovation Funds (SIF) and other funds provided to support the advancement of MDO solutions.

> **"Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world."**

Overview of AFWERX

Project Highlights and News Articles

AFWERX

> " Stories connect us at a human level that factual statements and logical arguments can't possibly match. "
>
> STEVE WOODRUFF, CLARITY WINS: GET HEARD. GET REFERRED.

AFWERX improves the efficiency, effectiveness, and quality of life of our warfighters. We do this through our capabilities discussed within this book, and those capabilities have even greater, reinforcing impact when we leverage stories. It is through stories that we get a sense of what something is really like. When it comes to a culture of innovation, Total Force Airmen (Active Duty, Reserve, Guard, and Civilian) are the pinnacle of shifting the culture within the Air Force. Every Airman at every level has a voice. In this chapter, we share some of the stories that people have written about our capability areas during our first two years. Through programs such as Technology Accelerators, Small Business Innovation Research (SBIR), and Design Thinking Challenges, we have created opportunities for greater warfighter agility.

also apply to the annual Spark Tank competition judged by the most senior leaders in the Air Force as well as a few heavy hitters in innovation and entrepreneurship. Here are a few stories about the types of campaigns and Spark Tank.

https://www.daytondailynews.com/news/local/afmc-seeks-innovative-ideas-through-ideascale-campaign/lRhAzjw2DRnPv2qTw53dYO/

https://www.af.mil/News/Article-Display/Article/2053169/air-force-announces-spark-tank-2020-selectees/

https://www.af.mil/News/Article-Display/Article/1771426/spangdahlem-ab-master-sergeant-wins-spark-tank-competition/

SPARK TANK

One of the platforms that allow Airmen to voice their ideas and collaborate with other Airmen on best practices and crowdsourcing solutions is the Airmen Powered by Innovation ideation platform. Major Commands and units could host campaigns to search for bright ideas at this virtual gathering place (https://usaf.ideascalegov.com/), and Airmen could input their ideas whenever a light bulb went off in their head. Airmen could

SPARK CELLS

While it's exciting to celebrate the tenacity and ingenuity of these Airmen on the big stage during the annual Spark Tank competition, it's important to note that the handful of Airmen selected to pitch their ideas on stage began with hundreds of applicants and thousands of Airmen solving problems locally at their base. Another AFWERX capability, Spark Cells, are the heart of the grassroots innovation movement across the Service. What began as two Spark Cells (innovation maker spaces and catalysts)

has grown to more than 50 across the Air Force in only two years. Take a look at some of the accomplishments from these home-grown intrapreneurs.

https://www.dailyrepublic.com/all-dr-news/solano-news/military/phoenix-spark-initiative-gains-strength-after-3-years/?fbclid=IwAR0NxWm0kPB1qsqg5S6z_JJqHwyTyfNO1hPwXP7nD4ph55DNsVEmfCYwPvl

https://www.robins.af.mil/News/Article-Display/Article/1968687/team-robins-sparks-innovation-spark-cell-hosts-inaugural-pitch-day/

https://www.edwards.af.mil/News/Article/2002476/university-students-help-jstars-innovate-scheduling/

AFWERX CHALLENGE

Some of the best ideas come to us when we are surrounded by people who think differently, see the world differently, and challenge our perceptions. By bringing together Airmen, industry professionals, small businesses, university students, and subject matter experts from various environments we enrich our understanding of what's possible. In order to expand the horizons of our Defense-focused perspectives, AFWERX implemented Challenges to define problems the Air Force is facing and widen the aperture to innovative solutions.

https://www.airforcemag.com/AFWERX-sets-sights-on-base-of-the-future/

https://www.af.mil/News/Article-Display/Article/1926016/AFWERX-fusion-mdo-challenge-drive-collaboration-between-industry-military-acade/

https://www.prweb.com/releases/AFWERX_vegas_fixed_wing_helmet_challenge_a_soaring_success/prweb15932301.htm

TECH ACCELERATORS

Another way AFWERX is partnering with startups is through the Air Force Accelerators. Working hand-in-hand with promising startups with direction and mentorship from prominent accelerator companies such as Techstars allows us to get in on the ground floor of emerging technology. According to Air Force Chief of Staff General Stephen W. Wilson, "We're going through a period in the globe of massive disruptions in politics, economics, social society, and technology. Any single one of those would be difficult to keep up with, and we recognize that technology is the one that is fanning the flames in all the others. We want to see what these companies have to offer, and are hoping to work toward being able to access startup ideas quickly."

https://breakingdefense.com/2020/01/techstars-grooms-10-tech-startups-for-air-force/

https://breakingdefense.com/2019/05/you-have-to-be-willing-to-bleed-a-little-bit-roper-on-innovation/

https://www.techstars.com/the-line/innovation-in-action/interview-with-captain-steve-lauver

SBIR OPEN TOPICS

Changing the landscape of how non-traditional industry partners and small businesses could join forces with Airmen to strengthen the Defense Industrial Base, seemed like it would be a monstrous challenge. However, what we found was that when you stop to see things from the other person's perspective and begin to eliminate, or at least minimize, roadblocks for them, the path to working together seems to smooth itself out.

With regard to the Small Business Innovation Research (SBIR) program, qualified small businesses rushed to join the party once we worked with the Air Force

Acquisitions and Air Force SBIR/STTR offices to reduce the application requirements for SBIR. Together, we implemented a selection process that helped many of these small businesses receive contracts within 30–60 days of applying, and decided to let any small business who thought they might have a solution bring the capability to the table. Even if all ideas were not accepted, we did not want to narrow our search for leading-edge innovations. This new way of doing business has proven successful for the Air Force and small businesses alike. The other Services have joined forces with us now, opening doors for military members and small businesses to collaborate and solve real problems.

https://www.af.mil/News/Article-Display/Article/2064878/dod-innovation-units-join-forces-to-engage-smallbusiness/

https://www.af.mil/News/Article-Display/Article/1895386/rapid-acquisition-leads-to-rapid-success-for-air-force-small-business-partner/

https://breakingdefense.com/2019/10/air-force-boosts-funding-cap-for-promising-startups/

AFWERX has lowered the barrier to entry for small businesses and research entities who may have never thought they had a chance to work with the military.

COLLIDER EVENTS

The Spark Collider Events allow Airmen, small businesses on SBIR/STTR contracts, venture capitalists, and Air Force contracting program offices to come together to hear pitches from Airmen, showcase solutions from small businesses, and match the Airmen pain points with a small business solution provider. The Air Force has also begun holding Pitch Days where companies get to pitch their ideas to contracting officials and leaders who can make on-the-spot decisions to award contracts. It's not a myth…it's really happening!

Here are a few articles to prove it!

https://www.af.mil/News/Article-Display/Article/1940520/air-force-advances-innovation-at-spark-collider/

https://www.af.mil/News/Article-Display/Article/1939889/Airmen-companies-tackle-mission-pain-points-during-AFWERX-spark-collider/

https://www.forbes.com/sites/forbestechcouncil/2020/01/13/how-the-armed-forces-can-help-your-startup-drive-innovation/#2ef7389342c1

https://www.airforcemag.com/article/instant-contracts/

> **"Stories connect us at a human level that factual statements and logical arguments can't possibly match."**

Operations

AFWERX

> " Herding cats is easy...herding Schrodinger's cat is a metaphysical probability between easy and something else. "
>
> HUSKY

THE PURPOSE OF OPERATIONS

Enabling change—in a large organization like the Air Force, we need to play well with others while simultaneously asking hard questions to encourage doing business differently.

LESSONS LEARNED & INSIGHTS SHARED

Decentralized Operations Requires Some Centralized Execution

Imagine seven hundred thousand people. The sheer number alone makes you blink twice. How but how do you possibly build something from the ground up that is expected to drive change in an organization that is 680,000 strong and spans the globe? From the very beginning, we always followed the warning, "Do not have a single point of failure."

The first inclination people may have as they try to affect change in such a massive, dispersed organization, is to go out and touch as many people as possible. Go to a decentralized model, get resources out to the people, teach by doing, streamline processes, etc. These are all great things, but what happens when your decentralized nodes stop talking? What happens if the resources are

not tracked? What happens when the things each node works on are not working towards a common goal? And worse, what happens when lines of effort begin to cross?

The over-simplified answer—chaos. Chaos, many believe, has no place in any large organization, especially the government. The structure is key, the process is important, and the organization is essential. While there is truth to this, there is a drawback to this bias for stability—one in which structure is rigid, the process is burdensome, and the organization creates stovepipes.

Throughout history, some of the most profound moments of innovation in the government have involved some form of chaos—the Apollo 13 "slingshot around the moon," the Manhattan Project, and our Nation's founding and shift from an Articles of Confederation approach to a Constitutional framework. These efforts each required traditional execution models to flex and allow for new ideas to spawn. The structure allowed people (and states) to think uniquely and outside of the box in order to develop, test, and execute new ideas. In doing so, they demonstrated that even within a government organization, a special form of chaos can lead to great things—controlled chaos.

In the organizational stand-up of AFWERX, the path forward was clear from the very beginning. We wanted to

have decentralized operations creating innovation hubs around the country and enabling spark cells at bases around the globe. Early on, there was no single "AFWERX" organization—we were a Coalition of the Willing, with leadership direction coming from multiple organizations. We were reliant on relationships with multiple established organizations that typically did not execute missions together. The AFWERX team was already decentralized and we were not going to be brought together any time soon. Even the funding for AFWERX came from an organization that was not making operational decisions. The guiding principle of AFWERX was in the form of a single email and an attached three-page white paper. It was for all intents and purposes...chaos.

In the coming weeks and months, that chaos began to be detrimental to the mission. It was not always clear who was in charge, no one completely understood what was and what was not AFWERX, and personalities began to clash. Something needed to change, but we were all cognizant that the pendulum could not swing completely the other way.

We began to slowly implement some process and organizational changes. Formal charters were crafted and clear lines of authority and responsibility were laid out, but in a way in which maximum flexibility was allowed. The execution of funding and resources became centralized to enable a behind-the-scenes checks and balances system that could ensure some structure and process was put into place while also being transparent to the team in the field trying to push the ball forward. The system was not perfect but it created simple processes, organization, and structure where there had previously been none. It put limits of control on the chaos, and this model enabled the AFWERX mission to scale towards a common goal in ways it had never been able to do before.

To this day, that model still pushes the limits of what many traditional organizations are familiar with. As AFWERX grows, there will be a need to change, but change is not unexpected. If the Apollo 13 mission changed after the initial "slingshot" to one which required years-long sustained operations in space, then the structure of that program would have morphed and likely looked much different from the structure that enabled the original innovation.

When driving change in a 680,000 strong organization, there is one consideration that we all must keep in mind—how can we use chaos to our advantage? How can we put the controls in place so that we can continue to grow and affect change? How can we create decentralized operations while ensuring some aspects remain centralized? And most importantly, how can we protect the innovation mission, without breaking the processes, structures, and organizations which enabled the organization to get to where it is today?

AIM BIG, START SMALL, ADVANCE ONE STEP AT A TIME

Everyone has dreams, some more attainable than others. Making it in the world of innovation is tough enough, but doing so within a traditional government environment takes a special kind of strength, courage, and a hardened mindset. You will always be met with someone ready and willing to bring you down or discourage you. The most disheartening part is that sometimes the people who deliver the hardest blows genuinely want you to succeed, but just don't see it happening. Embracing and encouraging innovation in this environment is equivalent to a children's fun run that takes place in an unsupervised candy store. Sure, everyone wants the kids to finish the run, but when each kid is handed a bag at the beginning of the race and is told to "have fun at the

event," no one really believes any kid will make it to the end, let alone make it through without cavities.

It is easy to imagine. When the race starts, the crowd starts off cheering, excited for each of the kids and that they are taking part in a fun run, but shortly after it starts, you can start to hear laugher and "awws" as the first kid—let's call him Billy—falls victim to the Gummy Bear display. The tone of the crowd on the sidelines is a mix of commentary from, "Oh look, Billy's going for the Gummy Bears! He can still do this! GO BILLY!" to "Nope, Billy's done, it was a good six-foot try!" Billy's parents are the most encouraging, but they themselves have their doubts.

If by some miraculous turn of events, Billy makes it past the gummy bears, he still has an entire store of temptation to fall victim to. All along the way, he's encouraged, but when Billy starts to listen closely, hoping to hear the encouragement he needs to make it past the chocolate bar display, in between their cheers of encouragement, he can hear his parents talking amongst themselves as to whether he's actually got what it takes or if he is just going to eat one of those candy bars and give up. Billy knows his parents want him to succeed, but he also knows they think the cards are stacked against him. Billy has a choice. He can give up and enjoy a few minutes of unsupervised sugar coma, or he can power down and finish the race, one sugary step at a time making it past the Gummy Bears and Chocolate bar displays, through the aisle of candy canes, down the slide lined with licorice, and down to the end where there is a three-foot edible marshmallow sculpture of Billy's favorite animal—a dog. What does he do?

The story may seem silly, but it is an allegory. AFWERX is Billy, and each one of those candy store displays represents our level of impact to the Air Force. When AFWERX started, the crowd was largely supportive, but before the race even began, we heard everyone talking loudly about how AFWERX was a great idea, but it would

never work and we should just quit. We still entered the race, and people wanted us to succeed, but very few people even thought we would make it to the gummy bears and the number of people who truly thought we could make it all the way to the end could be counted on one hand. AFWERX had a choice. Do we buckle down and go for it? Try and surprise everyone? Or do we just give up? Get to the display we want to eat and stop? AFWERX went for it.

Just like Billy, in order to do this, AFWERX had to be willing to start small. We wanted to have a great impact, but we knew we couldn't just skip the little ones. The initial AFWERX successes were small. 3D printed tools coming out of Spark Cells, getting equipment to operators in the field to solve their own problems, etc. These were our gummy bears. The crowd thought it was cute, but few thought we would have any meaningful impact. Like Billy, we kept pushing, and when we got to the chocolate bar display, we helped a program office acquire new prototype helmets. The crowd, while impressed, still had their doubts—AFWERX "playing" with helmets was not going to change the Air Force. Just because Billy made it past the chocolate doesn't mean he'll make it to the end.

AFWERX and Billy kept pushing, and by the time we got to the Candy Cane Aisle, we were partnered with new organizations and redefining the Air Force SBIR program and cutting acquisition timelines. Still, much of the crowd remained doubtful. Running quickly through candy canes could just mean Billy didn't like candy canes, but there's a giant marshmallow dog at the end and he won't make it past that. For AFWERX, SBIRs were just small contracts, but we would never make it to our marshmallow dog – big Air Force acquisition.

Billy and AFWERX are still running right now. There is still a long way to go before Billy makes it to the

three-foot marshmallow dog, but even then, Billy must decide— does he eat the marshmallow dog in celebration, or does he wait to see if his parents offer him something even better because they are so proud of him. For AFWERX, or any government organization, it's easy to view big acquisitions as an end goal, but we too will need to decide—do we stop there or do we see what else we can do?

Innovation in the government, like a children's candy store fun run, takes time, perseverance, and determination. While small victories may seem inconsequential to others, they are essential to building the confidence of those around you and building yourself up to where you are

mentally and physically prepared for your greatest challenge. Don't ignore them. The innovation world will always be full of many people who will encourage you but who will also be doubtful and may at times deliver some morale blows, but at the end of the day, whether you are Billy, AFWERX, or some person or group trying to do new things – getting to the finish takes time.

...Take the little victories where you get them, aim for larger ones, and work as hard as you can to make a difference, one sugary step at a time.

> **"Herding cats is easy...herding Schrodinger's cat is a metaphysical probability between easy and something else."**
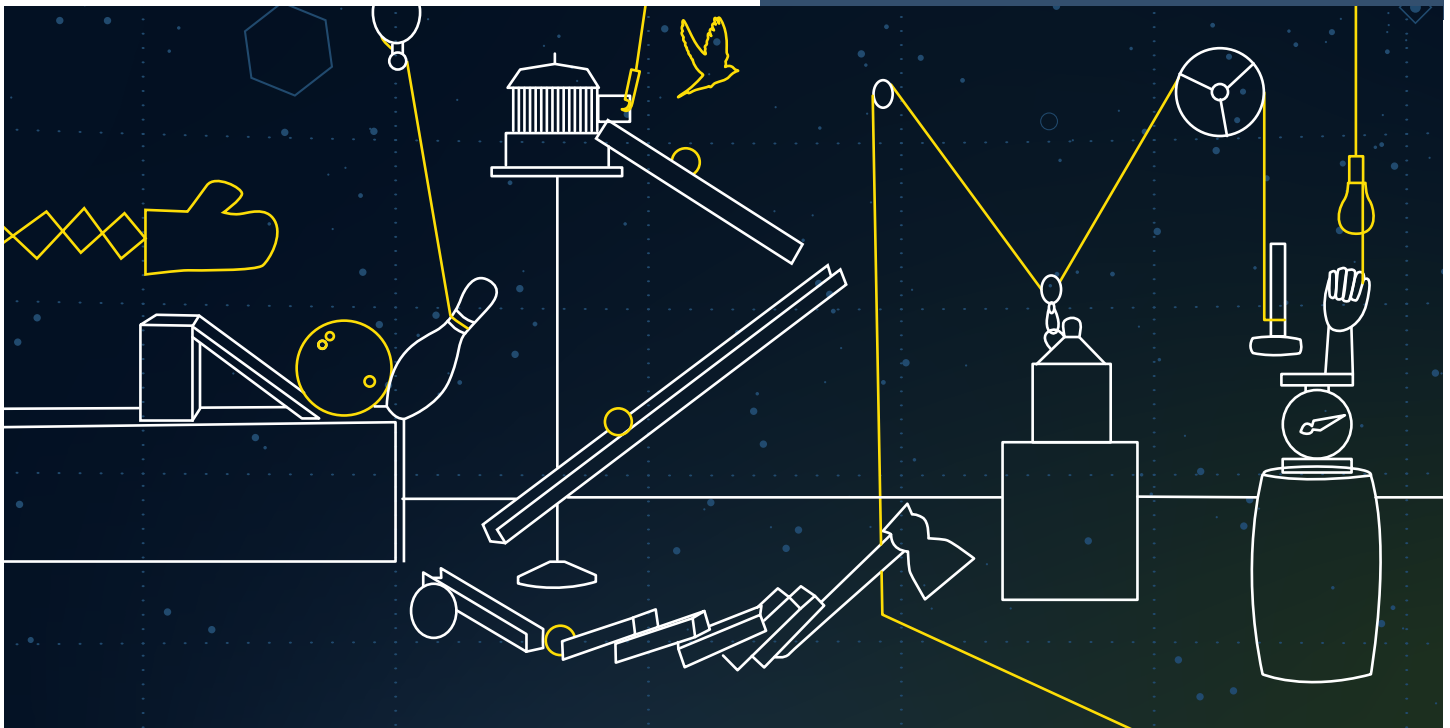
Overview of AFWERX

Mission Lead

AFWERX

> " Empower. Innovate. Defend.
>
> AFWERX CREDO "

THE PURPOSE OF THE AFWERX MISSION LEAD

Cultivate a fusion of capabilities who connect innovators and accelerate technological and cultural innovations in order to increase Air Force, Joint, and Coalition agility and lethality.

GUIDING PRIORITIES

- Develop and implement capabilities to increase warfighter agility

- Unleash Airmen innovation capability—anytime, anywhere

- Create and leverage an engaged, possibility-expanding ecosystem

LESSONS LEARNED & INSIGHTS SHARED

There are certain organizational characteristics associated with innovation success; our characteristics are like WATER

W: Warfighter-focused. A successful innovation effort, and its guardian organization, should always have end-users of its products in mind and as collaborators during the many iterations of prototype development. For AFWERX, our end-users are warfighters. The warfighters' needs are our #1 guiding priority. If we are not producing greater capability within a kill chain (kill chain: the series of technologies and people interactions associated with the finding and destroying targets) or supporting a function of that kill chain, then we have not executed our mission.

A: Agile. Creating options at the speed of relevance is both a cultural mindset and a structural consideration. For example, we only hold one mandatory meeting for our nationally dispersed team per week for one hour. We aim for a minimal level of weekly reporting products and other bureaucratic oversight. Wherever possible, AFWERX seeks to allow our front-line innovators, in collaboration with our end-users, to make the decisions necessary to execute their part of their mission. This helps keep our development speed faster and avoids the dangerous time trap of too many senior-level reviews.

T: True to our core: Connect Innovators, Accelerate Results. A popular saying often attributed to Albert Einstein

is that "If you cannot explain it simply, then you do not understand it well." Within AFWERX, our four core words:

CONNECTING INNOVATORS; ACCELERATING RESULTS

...speak to our strategy for advancing warfighting capabilities. Similarly, we followed the simple approach again when we constructed the structures to execute our four-word strategy, which is arranged in the flow of demand and supply displayed within the INTRODUCTION to this book. For the historical record, our deceptively simple-looking "Innovation Demand and Supply" system required nearly 20 months of experiments and iterations before we had crafted it into its fairly stable flow of relationships. Simple can be hard to achieve.

E: Empowered Talent. A key ingredient to our AFWERX team is our Coalition of the Willing...and the Educated. You would not hand over a multi-million dollar Air Force aircraft to someone who has never flown and say, "Go fly that." Similarly, you would not start an Air Force-wide innovation system by picking people at random and saying, "Go drive innovation."

AFWERX had the good fortune, and deliberate development, to bring in talented innovators whose formal and informal training and experiences supported their ability to empower others to "get stuff done." Our empowered, front-line innovators move with greater speed and agility because they have studied or practiced with innovation frameworks such as Design Thinking or Lean Design. With this educated talent, it was possible to credibly execute our strategy of centralized intent, decentralized execution.

R: Relationship Building. The official core membership

of AFWERX resided in about a dozen government personnel slots, but AFWERX has over 150 members who contribute part-time and full-time to various innovation projects. We seek to create win-win opportunities for those who join us to work on projects. AFWERX does not force projects upon organizations.

It is through friendly, transparent, and hard-working team actions that our innovations advance. The resulting camaraderie and trust built while pursuing these worthwhile goals created a powerful culture of solid relationships and effective efforts. This has sometimes meant turning down projects or reducing relationships when the efforts and energy expended by us did not appear to be reciprocated by others. AFWERX does not seek a certain *quantity of individuals* to reflect our relationship strength. Instead, we seek a *quality of talent* that values and amplifies certain kinds of relationships and can help scale the impact of what we drive for the warfighter.

THERE ARE CERTAIN PROJECT CHARACTERISTICS ASSOCIATED WITH INNOVATION SUCCESS

Our perspective looks like five interconnected factors

The diagram displays the criteria we have used, based upon years of experience and research with successful projects, to assess whether a project (or "experiment") has the minimum factors necessary to start the journey towards success. The factors will be referenced in a number of the following chapters, and are worthy of extra emphasis. They are:

I: Intrapreneur: Who will be the project's champion? AFWERX can do much to provide innovative answers to a challenging problem, but unless there is a project champion(s) who will persist in the solving of the problems, the project stands little chance of being

carried through to a successful conclusion. AFWERX has collaborated with intrapreneurs who were end-users of innovative ideas, as well as non-end users such as acquisition program managers.

II. Resourced Advocates: Numerous, good innovation ideas are proposed every day. One way of initially prioritizing them is to ask the owner of an idea, "Have you secured any funding for your idea?" This pragmatic question helps reveal ideas that have been found to be of value by someone other than the bringer of the idea. After all, the bringer of the idea may have a bias in their idea valuation.

Funding also provides a confidence signal that the proposed "experiment" has a reasonable chance to lead to a productive result. AFWERX does not have much of an investment fund for interesting projects, and even when we do, we prefer to offer "matching funds" to a project leader who has already obtained funding (through some form of project review). AFWERX is still small compared to a 680,000-member Air Force, so as we seek to empower others, we must use some selection criteria for picking the projects that we will pursue with intrapreneurs. Pecuniary resources offer one such criterion.

III. Solution Providers: Whether through competition or through commercial off-the-shelf products and services, a solution to an intrapreneur's challenge often resides within a technology. Connecting innovators to these option suppliers—government, industry, academia, investors, entrepreneurs—is a key factor within our processes.

IV. Engaged Leadership: An organization, a mission, or even a singular project can only rise to the level of its leader's vision and support. If intrapreneurs have leaders who support their innovation efforts, then good momentum can be created. However, if a leader opposes an innovation effort, or is apathetically neutral

towards innovation efforts, then the efforts will likely collapse. Some level of leadership support, such as a verbal acknowledgment to allow an Airman to support a project for four hours per week, has seemed minimally necessary for Airmen to guide their projects to successful conclusions.

V. Public Affairs (Marketing and Communication), Contracting, and Legal: "Early and often thereafter." That phrase captures how frequently innovators should engage with these three critical allies. You are far more likely to find a "Yes, if..." path for new experiments if you gain the brainstorming and project shaping insights from teammates possessing these three supporting core skills. AFWERX has been both deliberate and fortunate in associating with a number of people and agencies who have a "Yes, if..." mentality that has also been accompanied by an appropriate sense of urgency. This was a powerful lesson learned. AFWERX did not have full-time allies in these areas during its beginnings and was not as effective as a result.

DO NOT BE AN "INNOVATION OFFICE." BE AN "INNOVATION EMPOWERMENT OFFICE."

Early on in our strategic thought process, we deliberated about how to be an innovation driver for the Air Force. As we researched various approaches, we often encountered evidence suggesting that if you have a designated "innovation office" or an "innovation leader," then the other, non-designated people might be more inclined to think "Innovation is their job, not mine." As a result, our AFWERX approach has been one of empowering others to innovate, and not merely us performing innovation actions in isolated locations. AFWERX has been asked to help expand our Air Force's innovative culture, and expand it we shall. Indeed, we will even take the time to write a "learning to innovate" book

in the spirit of offering more "innovation empowerment" to our Airmen and other allies.

THINK BIG, START SMALL, FAIL CHEAP, LEARN FAST, WIN BIG (AT SCALE)

How do you prepare for uncertainty? The heart of successful innovation is to place a number of small bets across a broad portfolio of initiatives and then achieve a net benefit result by having the bigger, positive outcomes outweigh the costs of the little failures. Remember, "failure" is only a "failure" if you do not learn from it.

Ideally, the little failures become cheap lessons learned and allow for faster learning curves and iterations of future efforts by all of the innovators who were involved in the mistake. "Failure" seems a poor label if lessons have been learned from an unsuccessful experiment. AFWERX has had its share of cheap mistakes. For example, we canceled a monthly First Friday community gathering event after the crowds diminished to a point where it no longer seemed worth the level of effort. We also stopped using software packages after they did not seem to be worth the cost. Within AFWERX, there is no single "all eggs in one basket" giant initiative to which we are beholden. If some process or product is not working as expected, and we have taken reasonable measures to try and adjust it to a better value, then we eliminate the effort, learn, and move on with a lesson learned and better future actions expected.

Sidenote: Many leaders did not like to hear the phrase "Fail fast" in isolation.

"BEAM, ARE YOU TELLING ME YOU ARE GOING TO DELIBERATELY FAIL?

No, not deliberately—unavoidably. No set of experiments will be 100% effective 100% of the time. Non-success is inevitable, but it can be cheap, and the learning from it will be valuable and rapid. Think Big, Start Small, Fail Cheap, Learn Fast, Win Big (at Scale).

YOUR ORGANIZATION CAN ONLY RISE TO THE SKILL LEVEL OF YOUR LEADERS

This concept was lightly introduced earlier but it is important enough to elaborate on it one more time. AFWERX enjoyed the support of some amazing senior leaders during our first two years, such as SES Jack Blackhurst, Lt Gen JD Harris, and Vice Chief of Staff General Wilson. These leaders accepted our WATER approach to performing our mission and treated us with a high level of empowerment and trust.

At the same time, we have encountered other organizations and environments that did not have the same level of support or empowerment. For example, some organizations had senior leaders who wanted top-level, polished briefings every week. At the extreme, one member of an innovation team confided in me that he had three briefings for three different generals that day...for the same project! Such oversight did not match with the start small, fail cheap, or learn fast approach associated with successful innovation approaches.

Every moment spent briefing, reflecting, and pausing for the good intention of reviewing is a moment when innovation is likely not advancing. There is always time for prudent reviews of progress, but that time should be properly weighed within the relatively low-cost risk that is occurring. If an innovation experiment fails, what is the actual harm? Typically, it is the loss of a few months

∧FW∃RX

5 Factors That Increase Project Success

PROJECT CHAMPION
(often an end-user)
understands the problem

INTRAPRENEUR

PATH FINDERS
Core skills needed
to create pathways

P.A., CONTRACTING AND LEGAL

RESOURCED ADVOCATES

ORGANIZATIONAL WILL
ensures solutions will be
deployed and transferred

ENGAGED LEADERSHIP

SOLUTION PROVIDERS

Stakeholders provide
FUNDING
for prototyping and scaling

INNOVATORS
from academia, industry, and
the investment community
help create new solutions

and a relatively cheap amount of money. Schedule your reviews accordingly.

The evidence from research advises that the best places to work have strong elements of purpose, trust, and camaraderie within the organization's culture. If you are a senior leader reading this, consider how frequently and with what tone you conduct your reviews in order to obtain comfort and trust with what your innovation team is performing. If you are a front-line leader of innovation, consider how you are relaying innovation's broader purpose (i.e., a national capability and weapon against adversaries) in addition to your project's performance as you present your initiatives. To paraphrase from Gregory Bateson, information is any difference that makes a difference, and the way that you treat innovation differently with your experimental mindset and words matters.

THERE IS NO SUCH THING AS ZERO-RISK, RISK-FREE, OR GUARANTEED SUCCESS. THINKING ZERO-RISK IS RISKIEST!

America's greatness was not built upon consensus-based governance. America has a history of leadership and governance that advanced our Nation on the basis of a 50%+1 majority vote. It has not been a perfect system, but it is hard to dispute the impact that the United States has had on the world.

Consensus-based reviews of projects are not democratic reviews. Within this approach, just one person or agency can disagree with a project's execution and everything grinds to halt. Achieving consensus at every step of an innovation effort comes at a cost of time. If you are subjected to a low risk, consensus-based, project review environment, then one effective approach (although it is not time efficient) is to over-communicate to all stakeholders in advance of the meetings, so that decisions can be made within the meetings. Otherwise,

you risk having your project become bogged down with seemingly endless questions and a group-think mentality where negativity is often easier than positive vision.

If you look at a project for flaws, then you will find flaws—finding flaws is easy. If you want to be safer, you will always find ways to be safer and burn down risk by additional reviews and analysis. Unfortunately, this leads to "paralysis by analysis." Innovation can be choked by these types of zero-risk mindsets. "Safer" needs to be measured against actual harm from non-success. If an innovation effort fails, and it has followed the start small approach, the harm is almost always minimal (assuming that the non-success is a technological one, not a relationship one).

URGENCY IS HARD TO COME BY, SO HOW MUCH OF YOUR PROCESS CAN YOU CONTROL?

It is reasonable to expect democracies to lack a sense of urgency for costly efforts when there is not an imminent threat. Can you imagine any Congressional member standing up within the House of Representatives on September 10th, 2001, and introducing an annual, $7 billion effort to help combat terrorism—and it should be called the Transportation Security Administration (TSA)? Without an actual threat apparent, no Congressional representative, nor rational voter, would be inclined to vote for that kind of expensive effort.

This rational cost-benefit mindset is similar at the organizational level. If people outside of your organization impact your operations, how likely do you think your requests are going to rise to the top of their inbox? Their incentive structure likely does not support them feeling urgency on your behalf. At its most cynical review level, I have heard fellow Pentagon colleagues say, "Once you

throw it over the fence (outside of your organization), you never really know how long it will take." Yes, you can shepherd efforts by walking the halls, ringing phones, and sending emails, but after a few months of those activities, you begin to realize how costly that shepherding can be as your time to perform other innovative acts diminishes.

For that reason, it is worth any innovation group's consideration to see how many of the key functions for innovation can be housed within their innovation organization. The minimum list would include your:

- Front-line innovators
- Finance / organizational money manager
- Legal, Contracting
- Public Affairs (communication and marketing)
- Director of Operations
- Mission Leader

Innovation is important—deadly important. Yet until a complete cultural evolution occurs across the U.S., it is prudent to not expect "fast track approval" on innovation initiatives, and so innovation organizations must plan accordingly while also trying to acquire the talent that can make projects move with the appropriately aligned sense of urgency.

INNOVATION BENEFITS FROM SUPPLY AND DEMAND RELATIONSHIP FLOW

**Versus "if you build it they will come"
static structures**

The deceptively simple-looking system of AFWERX has a key element of innovation demand that is not typically

discussed as a separate topic. However, it serves a very important function. Our "innovation demand" capabilities proactively find challenges and pain points at the Air Force levels of the individual Airman, an organization (i.e., office, base, headquarters), and senior leaders. By proactively seeking out and offering pathways for our Air Force's intrapreneurs to pursue their five-factor project proposals, we help further unleash our Air Force's innovation capacity.

Whatever form your innovation system takes, consider having a proactive innovation demand function that extends invitations to intrapreneurs (including virtually). This offers a better chance of more innovation being accomplished, especially compared to an isolated innovation structure where people may have to overcome the additional hurdle of their own introverted, internal hesitancy to approach a group of strangers and ask those strangers to listen to their idea.

INNOVATION HAS A SPIRITUAL WARFARE COMPONENT. PERSIST!

Thomas Edison referenced over 3,000 thoughts and experiments in his pursuit of the light bulb. What kind of inner drive, what kind of morale, must he and his team have possessed? During a different experimental cycle with batteries, when an interviewer asked Edison about all of the experiments that Edison had performed that had not led to any results, Edison replied and smiled, "Results! Why, man, I have gotten lots of results! I know several thousand things that won't work!"

Thousands of fail cheap and learn fast moments built up the effectiveness of Edison and his organization. For more insights into Edison, please see http://edison. rutgers.edu/newsletter9.html#4.

A spirit of persistence is critical to the experimental nature of innovation. This spirit was memorialized by

former President Calvin Coolidge when he wrote:

> "Nothing in this world can take the place of persistence.
>
> Talent will not; nothing is more common than unsuccessful men with talent.
>
> Genius will not; unrewarded genius is almost a proverb.
>
> Education will not; the world is full of educated derelicts.
>
> Persistence and determination alone are omnipotent. The slogan 'Press On!' has solved and always will solve the problems of the human race."

...Embrace this spirit.

INNOVATION NEVER SLEEPS... BUT YOU SHOULD!

It would be incomplete to talk about the nature of innovation and our "startup" experience without also mentioning the natural complement to all of our activity— designating time for rest and reflection. No matter how strong your spirit, it is still contained within a material body…and bodies need rest.

At a meta-level, nature offers us a guide for rest. Before a season of new beginnings (spring), and after a season of high performance and heat (summer), there is a season of slow down (fall) and rest (winter). Body fitness efforts also provide us with clues. It is rare to exercise and work out the exact same muscle groups two days in a row. Even the marathon athletes, who are seemingly always running, will intersperse high-speed sprint workouts for their legs' fast-twitch muscles, as a complement and rest for their longer, endurance striding muscles.

The act of innovation is an exciting, engrossing, and

energy-demanding endeavor. If you are to effectively persist within innovation, you will benefit by finding good harmony with reflection and recovery actions or non-actions. AFWERX deliberately pauses twice a year to gather our nationally dispersed team and reflect upon where we have traveled, where we are, and where we might next go. We call these two-day events "Common Mind" gatherings...not "Commander's Call," "Mission Lead Call," or any other "leader"-centric title. AFWERX is a Common Mind composed of amazing Talent filled with a spirit of Innovation and Persistence. We must remind one another to schedule time to step away from our mission activities. With rest and recovery, we can emerge stronger for the duration.

"Empower. Innovate. Defend."

PART ONE
Uncovering Ideas
and Opportunities

AFWERX

Spark Tank

Spark
Tank

AFWERX
Spark

Virtual
Tools

Senior
Leaders

Major
Commands

PATH OF OPPORTUNITY

> "I cannot believe it takes this much work for a 60-minute slot at AFA Orlando!"
>
> TW

THE PURPOSE OF SPARK TANK

An annual, Air Force-wide event designed to incite an innovation culture among Airmen while recognizing and showcasing their extraordinary contributions.

A BRIEF HISTORY

In 2017, a collaboration between Airmen Powered by Innovation (SAF/MG), Chief Transformation Officer Ms. Lauren Knausenberger (SAF/CN), and AFWERX initiated the annual Spark Tank competition, co-sponsored by the SecAF and CSAF. The event, a take on TV's Shark Tank, has been designed to be a high energy/fun annual Air Force innovation capstone event that culminates a great year of problem-solving by showcasing Airmen "Intrapreneurial" creativity. We present Spark Tank during the February Air Force Association (AFA) gathering.

KEY HIGHLIGHTS

Submissions increased from 40 in 2017 to 300 in 2019 as we became better known, MAJCOMs (such as ACC and AMC) created their own competitions for selecting Spark Tank competitors, and we offered a collaboration website for the submissions.

LESSONS LEARNED & INSIGHTS SHARED

There is a Benefit to Utilizing an Ideation Platform over a Task Management Tool (TMT)

Spark Tank is for projects that have the highest probability of delivering a revolutionary impact to the Air Force within six months to two years time, as determined by a panel comprised of the Secretary of the Air Force, Chief of Staff of the Air Force, and Chief Master Sergeant of the Air Force (and guest judges from industry). It is an annual competition that aims to collect innovative solutions for common problems in the Air Force. This is an internal-facing challenge aimed at Airmen and AF civilians. Now in its third year, a major lesson learned from the initial 2018 cycle was the process by which the ideas are collected.

Originally, ideas were being collected by sending out a TMT message (TMT: an Air Force-wide, Task Management Tool application for assigning work) to all Major Commands (MAJCOMs) and Headquarters Air Force offices. This announcement laid out the specifics about Spark Tank, conveyed deadlines and asked for up to two submissions from each of the organizations. The grading and reviewing of ideas were kept internal to each organization with some loose parameters prescribed to aid them in the judging process—the potential for impact (e.g.,

time savings, cost savings, morale benefit), the feasibility of the solution, and ability to articulate a path forward.

Community involvement and peer feedback were not included at this stage of the process. Most of the submissions to the 2018 Spark Tank were determined internally by the MAJCOMs and the AFWERX team had no visibility of the range of ideas. As the submission deadline arrived, we received close to 40 ideas, and a subsequent panel of AF leaders picked six ideas from this group to advance to the final board at the Air Force Association's annual February gathering in Orlando.

For the second iteration of Spark Tank (2019), we utilized an online ideation platform called Ideascale (https://usaf.ideascalegov.com/), provided by AFWERX, which was accessible by any Airman. The collection, review, and grading process was transferred over to an online portal. This change had many positive and negative effects.

Positives: Total submissions to the campaign went up from 40 to over 300. The ability to comment on ideas made it easier to refine submissions and connect idea owners to other Airmen who had insight into the problem space. The voting capability made it easier to distinguish the popular submissions in the campaign. Due to the AF-wide access, MAJCOMs were now able to access submissions from other organizations and find common pain points affecting multiple bases. Grading was made easier with the tools available on the platform and overall clarity was improved due to the different stages that ideas traversed. As ideas were selected, they kept moving down the funnel for the next round of review. By the end, we had more ideas that could be developed further by us or our allies within the Airmen Powered by Innovation program—ideas to which we would have previously been blind.

Negatives: The original campaign goal was to pick the six best ideas and execute their proposed solutions.

The manpower and funding allotted to executing the challenge were also based upon this baseline expectation. With seven times more submissions for the 2019 event, it was challenging for the program executors to provide a satisfactory review and decision analysis feedback to each submitter. This justifiably created some negative emotions towards the campaign. Some Airmen felt that their ideas were not equitably reviewed and proper justification was not provided to explain why the ideas were not selected. Some of this also goes back to proper expectation management—ideas selected by MAJCOMs as their top picks were provided with $2,500 innovation awards, but not all selectees were promised a pathway by which to execute their innovative idea.

Conclusion: In our third Spark Tank iteration, we have expanded the internal Spark Tank team and have asked our larger team to review and grade ideas submitted for Spark Tank 2020. Additionally, we have also asked MAJCOM POCs to provide accompanying comments when selecting ideas. The intent is to make the selection process more transparent.

MONEY TYPES ARE BEHIND THE SCENES ISSUES WITH UPFRONT IMPACTS

For the first two iterations of Spark Tank, the majority of funds allotted to the campaign were from the "Airmen Powered by Innovation" unit from SAF/MG (approximately $3M in 3400 funds). With this color of money, the project implementation was limited to the O&M style scope of work. This worked fine when funds were needed for travel, professional services such as workshops, or for buying COTS for solution implementation. These funds did not work well when any RDT&E efforts were needed, such as prototyping efforts, which are vital for a majority of Spark Tank projects.

Positives: A better understanding of money types was gained and a money type determination review was added to the execution timeline of each project.

Negatives: Not having access to 3600 funds restricted project implementation and induced delay in the overall execution timeline. We had to find other AF entities with 3600 funds that were interested in funding some of our finalists.

Conclusion: After major delays were incurred in project execution, AFWERX was able to commit some 3600 funding ($1.8M) starting in the Fiscal Year 2020 (FY20— Department of Defense fiscal years run from October 1st through September 30th). This, along with the 3400 funds from SAF/MG, will provide the campaign enough flexibility for matching projects with appropriate funding.

PREPARE EXECUTION PATHWAYS FOR SELECTED PROJECTS

Spark Tank selects six finalists from numerous submissions. At AFA in Orlando, the top three leaders in the Air Force— SecAF, CSAF, and CMSAF— are joined by civilian innovation leaders and together they vote on the six innovation pitches. While there is one ultimate Spark Tank winner, all six finalists' projects have been supported to turn them into realities, including the use of contracting and finance offices from AFWERX and our allies in the Secretary of the Air Force Management Directorate (SAF/MG).

Finalist projects are normally supported by acquiring certain services, adapting a Commercial Off The Shelf (COTS) solution, or accomplishing some form of prototyping effort. Based upon the type of effort, a determination of the type of money is made for funding the project, such as with "3400" or "3600" types of money. 3400 funds, also called Operations and Maintenance

(O&M) funds, are primarily used to acquire services and COTS solutions while 3600 funds, Research, Development, Test and Evaluation (RDT&E), are used when some form of prototyping is needed. Preparing in advance for all such funding scenarios was challenging and a major lesson learned from Spark Tank 2019.

After the six finalists were selected in December 2018, we held our first teleconference with the teams in early January to go over expectations for the Spark Tank event. Something we did not emphasize enough was an extensive set of execution documents for their respective projects that the Finance reviewers would require later in the process. After AFA Orlando, when we started executing the six projects, the finance reviewers required multiple planning documents that went over the scope of work for each project. Incomplete or insufficient documents caused delays, and then the internal reviews to determine the type of money for each project could take another 6–8 weeks.

Positives: After going through the extended review process, we have implemented some changes for the 2020 Spark Tank. Execution documents from finalists are now mandatory by the end of January, a full month before the Spark Tank finals. This will help us in starting the review process even before AFA occurs at the end of February. Based on the outcome of the review, we should be able to flow either 3400 or 3600 money to each project in a timely manner. We have also included a finance representative in our planning committee to better understand the review documents and set the requirements for each finalist.

Negatives: Not planning for all of the internal reviews such as money type determination delayed the execution of each project and caused a lack of deliverables in FY19.

Conclusion: In the third iteration of Spark Tank we have embedded a finance representative with the

planning committee. The representative can intelligently communicate with the finalists regarding execution document requirements. We also have coaches and mentors assigned to each team to support their execution pathway. We believe this will result in a streamlined internal review process and we expect to start implementing projects in March 2020.

PITCH COACHING IS BENEFICIAL, NO MATTER ONE'S EXPERTISE

Spark Tank finalists brief the Air Force's Top three leadership on how their idea will have a tremendous impact across the AF. This brief is accomplished within two–three minutes on stage at AFA with thousands of Airmen in the audience and watching the live stream. While some teams seem naturally equipped to speak to such a crowd, others are not. For Spark Tank 2019, we matched each team with a pitch-coach for virtual training before the competition. The teams' interaction with the pitch coaches was loosely tracked and we assumed that the teams would be well prepared for the event.

The day before the event, we held an in-person dry run and found some teams were still not ready with their pitches. The two coaches we had at the event did their best to guide the teams in a short span of time. While the pitches at the event went fine, there was clearly more that we could have done to produce a better product for the AF leadership and the audience.

Positives: The teams provided proactive requests for pitch coaches and more importantly having practice time with coaches before the event at AFA Orlando.

Negatives: A more polished product could have been presented at AFA, and hence the lesson learned.

Conclusion: We have enlisted the help of some professional pitch coaches, based upon the targeted

industries. We connected our finalists to these professionals sooner in the process (December 2019). Some coaching will also be provided by the team at the AFWERX-Vegas Hub and we will have a dry run for the pitches in early February to vet the delivery quality and to provide constructive feedback with enough time before the event for presentations to be improved upon further. We will also provide some graphic design support to aid visual storytelling.

"I cannot believe it takes this much work for a 60-minute slot at AFA Orlando!"

AFWERX Spark

Spark
Tank

**AFWERX
Spark**

Virtual
Tools

Major
Commands

Senior
Leaders

PATH OF OPPORTUNITY

> **Men Wanted: for hazardous journey, small wages, bitter cold, long months of complete darkness, constant danger, safe return doubtful, honor and recognition in case of success.**
>
> ERNEST SHACKLETON'S AD FOR THE ENDURANCE'S CREW

> **Worldly wisdom teaches that it is better for your reputation to fail conventionally than to succeed unconventionally.**
>
> JOHN MAYNARD KEYNES, ECONOMIST

> **An escalator can never break: it can only become stairs. You should never see an Escalator Temporarily Out Of Order sign, just: 'Escalator Temporarily Stairs. Sorry for the convenience.'**
>
> MITCH HEDBERG, COMEDIAN

THE PURPOSE OF SPARK CELLS

Spark is a decentralized network of semi-autonomous innovation cells at the base level. These cells provide tactical level Airmen entry points to the broader innovation ecosystem and legitimacy not normally afforded to Airmen at their level. Airmen use these 'on-ramps' to solve the everyday problems they experience while executing the mission.

A BRIEF HISTORY

The single Spark Cell grew to a network of 58 cells as 2019 concluded, and the network of Spark Cells is projected to be above 80 by the end of 2020.

KEY HIGHLIGHTS

The Spark capability has brought together Airmen from all across the Air Force and the world for gatherings such as Spark Summit training events and "collider" conversations with industry and Small Business Innovation Research (SBIR) programs. 2019 included the launching of the Desert Spark cell at Al Udeid and their first Spark Tank competition. Lastly, An Innovation Handbook (v1.0) has been created and disseminated to all MAJCOMS and Spark Cells.

LESSONS LEARNED & INSIGHTS SHARED

Our inspiration: Brett Turner—the (non)founder of Kessel Run

Before diving into the specific structure of the Spark model, the skeptical mind has reasonable cause to question and ask the value of providing tactical-level Airmen with direct access to the nation's best and most rapid innovation pathways. As you read the following real-life case study, please consider the following which served as our inspiration.

Kessel Run is the first software factory in the neo-DevOps era of Air Force software development. Specifically, Kessel Run was established to develop and deliver software solutions to CENTCOM's Combined Air Operations Center (CAOC). Launched in late 2017 after a Google executive nudge and Office of Secretary of Defense (OSD) muscle for backing, Kessel Run has proved the value of DevOps principles as applied to a military organization. Through the traditional Department of Defense paradigm, Kessel Run moved from a concept to a warfighting capability at hyper-space speeds.

But could we have delivered the Kessel Run capability faster, without needing a tech executive and an OSD innovation team to move the concept across the reality goal line?

Some historical context may be instructive. Tanker aircrews have been continuously deployed in the Middle East since the 1990s. For coalitional forces to maintain Air Supremacy, hundreds of thousands of tanker sorties have been flown in support of chronologically dovetailed operations like Desert Storms, Desert Shield, the Global War on Terrorism, and Enduring Freedom. As the saying goes, "no one kicks a$$, without tanker gas" or "NKAWTG." These missions are centrally planned at a CAOC. While the enemy has changed and evolved, the planning and execution of the tanker schedule had not.

Planned by a deployed team, led by a tanker pilot, data from multiple sources are manually synthesized and optimized on whiteboards with dry erase markers.

The importance of the daily tanker plan cannot be overstated. Most CENTCOM fighter, bomber, and Intelligence, Surveillance, and Reconnaissance (ISR) activity are predicated on the tanker plan being accurate.

Enter Captain Brett Turner, an experienced KC-10 Aircraft Commander who in late 2016 served a six-month deployment to the CENTCOM CAOC as a tanker planner. Over the course of his deployment, he mastered the process of manually scheduling tankers using the whiteboard and his brain. While Brett did a great job creating a daily tanker plan with the tools afforded to him, he continuously felt that the world's best Air Force could be leveraging pretty basic computer technology to create a more optimal daily tanker plan and be less reliant on the daily creativity of the tanker planners.

With its voluminous information and disparate data sources, the tanker scheduling process was riddled with opportunities for human error. Additionally, even someone as clever as Capt Turner became reliant on heuristics and cognitive biases in order to balance the competing values of (1) over-scheduling tankers to mitigate against the maintenance delays/cancellations and (2) minimizing tanker sorties in order protect tanker crews from needless combat sorties.

Brett successfully finished out his six-month deployment as the tanker scheduler, earning accolades from his Air Boss along the way, but he could never shake the thought that the Air Force could be planning and executing the tanker plan better.

Upon returning to Travis Air Force Base (AFB) in the early spring of 2017, Brett serendipitously met representatives from a relatively new organization called DIUx (Defense Innovation Unit Experimental, now called DIU). Brett

eagerly shared his experience as a tanker planner and the opportunity to modernize the process using optimization algorithms and computers. The DIUx reps were productively inquisitive as Brett went into greater and greater detail. After the discussion, there was no talk of further exploration or actions requiring follow-up.

Fast forward to the fall of 2017. The Defense Innovation Board and DIUx are visiting that CENTCOM CAOC. Specifically, Eric Schmidt, Google Executive, was dumbfounded to see how the daily tanker schedule was created using whiteboards and dry erase markers. He followed his disbelief with recommended modernization actions that involved optimization algorithms and computers. This recommendation turned into action by DIUx, who started a tanker optimization software project which spawned the creation of Kessel Run.

This begs the questions: Is Brett Turner a technology clairvoyant who demonstrates the same cognitive capabilities as Eric Schmidt? Should Brett get credit for the tanker optimization tool and planting the seed for Kessel Run? Perhaps not, but if you're asking these questions, then you have likely begun to see the sometimes overlooked value of our Airmen's ideas.

The point of the story is that the US Air Force lost six months of capability because of its failure to act on a tactical-level Airmen's problem. Bottom Line: Listen to the people executing the mission…and get out of your office to talk to them. Opportunities will be missed if Airmen's ideas fall on deaf ears.

YOU'LL BE SURPRISED WHO WILL FOLLOW YOU OUT ON THE LEDGE

There are folks like Brett Turner throughout our Service—driven Airmen who are willing to work towards a solution, but they don't know where to start and/

or they're not organizationally positioned. Each one of these overlooked Airmen represents a lost opportunity to create more capability. Therefore, it's incumbent on the organization to provide structure and pathways, if the organization hopes to realize the upsides of these driven Airmen.

This leads us down the path of the 'innovator's dilemma,' a concept coined by Clayton Christensen. In his 1997 book by the same title, Christensen concluded that there are two ways to effectively innovate within an established corporate structure: (1) acquire another company or (2) create an internal spin-off. In both cases, the new entity must not be measured by the standard metrics of other parts of the business; instead, it's expected that these new entities will yield disproportionate returns with large variability. That is to say, if a company expects (and will only pursue) ventures with 20% margins, the new innovation entity should not rely on that same decision criteria when choosing efforts to pursue. Expectations-wise, the expected short-term return on these innovation efforts should be zero; but over time because of the non-linear upside of successes, these innovation efforts provide an aggregate return that justifies their existence. Furthermore, the innovations and innovators will fundamentally challenge the core assumptions that have made the company successful up to this point as they test opportunities that will keep the company relevant in the future. Airmen at Travis Air Force Base did just this. They created an innovation cell that would be responsive to Airmen intrapreneurs and forge pathways for solutions. This model's non-traditional structure turned into the AFWERX Spark program; a tactical-level innovation model that helps Airmen intrapreneurs get tomorrow's tools to the warfighter today.

WHERE TO START?

There is no silver bullet or cookie-cutter method for creating a Spark Cell. By design, the process is going to be iterative and the structure will be dynamic based on the needs and environment in which the Spark Cells exist. However, there are some converging factors that need symbiosis for the primordial medium to spawn life: a team of intrapreneur Airmen; leadership support; and purpose.

Intrapreneur Airmen: The term intrapreneur simply describes employees within an established organization that are entrepreneurs at heart. The challenge, especially in the military, is how to balance good order and discipline while pursuing activities that may be counter to the traditional chain of command and governing Air Force regulations. At the end of the day, the military operates in a unique environment where time-critical situations exist and orders must be followed without question. While this could be a whole chapter on its own, in short, we need to trust our Airmen's ability to differentiate between situations and act on our core values: integrity first, service before self, and excellence in all we do.

Leadership support: Leadership support comes in three parts: (1) provide an environment conducive for intrapreneurs, (2) provide top-cover and access across the traditional structure, and (3) provide and advocate for resources. How this is done will be based on the individual, but in general, leadership is enabling the team of intrapreneurs to operate. For consideration, the leader could also be one of the intrapreneur Airmen, since in many ways we're all subordinate to someone. Leaders should go 'long' with their innovation investment and understand that the returns may not materialize within their tenure, and instead come later in the form of inspiring future Airmen leaders who will perpetuate similar activities.

Purpose: There needs to be a 'true' intent and pursuit of value-added activities for the Spark Cell to thrive. Leadership should provide strategic direction, then allow the innovation team to find meaningful pursuits within these boundaries. This alignment can be a conversation and may dynamically change as the organization learns. Intrapreneurs want to work on projects that add value and are bigger than themselves and the leader's strategic guidance helps ensure that efforts won't yield non-value added results. Nothing is more disenfranchising than when the innovation team and the leadership disagree on the value of the result. Avoid this by being clear and aligned on purpose from the start.

The story below is from Travis Air Force Base where they created a successful innovation cell. Travis is used as an example not because it's the best Spark Cell or the first…but it's a story that is an example of how empowered Airmen with leadership support and purpose were able to step out of Plato's cave and live to talk about it.

One day a captain asked his Squadron Commander if he could be the Chief of the Travis Air Force Base Innovation Office. No organization like this existed at Travis, so perhaps it was not surprising that the Squadron Commander responded with a look of skepticism, some pejorative comments, and a little chuckle. The captain was still standing there…and was serious—he really wanted to start an innovation office at Travis. So the Squadron Commander asked, "When can you have a briefing ready for the Group Commander, the first O-6 in this chain of Command?"

Two weeks later the Squadron Commander accompanied the captain to the Group Commander's office. To an audience of three, the Captain pitched the "innovation office" concept: when executing the mission, our Airmen experience problems that they want to solve; however, they don't have the time or the expertise to get to

meaningful solutions. The innovation office would help Airmen understand their problems and find internal and external partners that could help deliver solutions. After 15 minutes of a non-standard Air Force brief, the Group Commander sat back, squinted his eyes, and said, "Your slides, can you explain why you didn't use the approved template. This goes against official guidance outlined in the memo released three months ago... did you read that memo?" After disbelief fell over the captain's face, the Group Commander cracked a smile and said, "Relax, I'm joking...this is great! What do you need from me: people, money...let's get after this and start an innovation office." With this, the captain was surprised with the unwavering support...but now what? The innovation office was approved...but how to execute on the things that were envisioned?

THIS INNOVATION STUFF ISN'T FOR EVERYONE...AND THAT'S OKAY

With the Group Commander's overwhelming support to start an innovation office, the next question was now what? How do you create a team and find pathways to give tactical-level Airmen access to the best solutions when Travis AFB was an operational base with no actual Research & Development (R&D) mission? The captain went out to find "early adopters" and a Coalition of the Willing. For context, think back to 2015 when Ash Carter was the Secretary of Defense. Secretary Carter saw a gap between what was happening in DOD R&D relative to the commercial and academic sectors in America. In many ways, these sectors were developing technology at a rate that outpaced what was occurring through traditional military pipelines. To bridge this gap, he created organizations like DIUx and the Defense Innovation Board; both strategic initiatives that took a top-down approach to innovation. While these efforts were good for the enterprise, all too often by the time

"innovation" reached the Airmen who actually execute the day-to-day mission, the intended concept was so diluted or non-existent that it often felt like no impact was realized. The Spark concept is an attempt to solve for the incompleteness of using only top-down approaches; it's the bottom-up part of Secretary Carter's bridge to non-traditional solutions. And the Travis Air Force Base Innovation Office was a start. The captain started by going around to the various Squadrons in the Group and talking to people. The concept was simple:

> Our senior leaders are doing innovation, why shouldn't we. We live with problems every day...we are the problem experts. Let's build a team that takes these problems and socializes them with experts that could solve them.

One advantage of Travis AFB was its geographic location from Silicon Valley. On the other side of the coin and for long-term success, the innovation office had to be "manpower neutral" to Travis AFB as a whole—there would be no request to Senior Air Force leaders for additional personnel to create the Travis Spark Cell. As envisioned, the innovation office would be made up of Airmen that deeply understand the problems and pain points related to the mission in which they officially support. The structure should allow them to progress and hone their skills as an operational asset but give them a conduit by which they have access to solution providers. For the innovation office to be successful, the startup team needed to be a true intrapreneur that operates both within the traditional structure and participate in innovation. They needed to be folks altruistically driven to burn the candle at both ends.

So as the captain went around talking to Airmen across the base, he was accepting of anyone but knew that this initiative wasn't for everyone. He told people that even though the Group Commander supported this effort, the members of this innovation office would need to

continue their normal duties and there was no budget. The innovation office was truly a bootstrapped startup. What the captain didn't overtly communicate as he went around was that the Group Commander said that the innovation office could get resources and time to explore these innovation efforts. Not showing those cards attracted the right people to be a part of the initial startup team.

INITIAL STEPS AND STRUCTURE

The first meetings were either early in the morning or late in the afternoon, times that were inconvenient to the average person. It stated that the innovation office was the wrong place for people that were looking for performance report fodder and everyone needed to continue their primary duties. The Airmen that continued to show up excited, were the Airmen that the innovation office needed to be successful. The structure that naturally formed over time included two main parts: the innovation office (the startup); and the problem owners (the startup's customers).

The innovation office had four main functions: (1) create a network of solution providers, (2) develop processes that would allow them to work with Travis AFB Airmen, (3) assist problem owners with understanding and defining their problems, and (4) facilitate/coach the interactions between the solution providers and the problem owners. One very important distinction of the innovation office (and thus for consideration of any Spark Cell)—the Spark Cell was not a place to lob a "good idea" and then expect it to be solved. The innovation office itself was not going to work on other people's projects, instead, it was an organization that could help other intrapreneurs work towards solutions that they wanted. This distinction is key for a couple of reasons. First, the core team is made up of volunteers that have normal jobs outside of the innovation space. They don't have the bandwidth to be

the lead on the number of potential projects. By making the innovation office a facilitator to problem-owners, this created a barrier to entry that simultaneously enabled more projects in the pipeline at any given time. Second, the goal was never to create a new organization. In a perfect world, there is no reason for an innovation office; it should be a part of who we are as Airmen that when we encounter problems worth solving, we should know the pathways to get solutions without having to go through an intermediary.

The problem owners can be viewed as the primary customer to the innovation office. These were the Airmen who had problems that they wanted to solve and who were also willing to be the project manager of the solution. There were varying levels of ability and ranks in this pool, but they needed to be willing to be an active part of getting to a solution. The unstated goal was to create more people that understood the resources available in the innovation space and become an evangelist within their own organizations. Furthermore, if these problem owners had a positive experience, they had a higher likelihood of joining the core innovation office, thus growing the overall capacity of the overarching effort.

THE APPROACH

The approach to any one project is rooted in the lean startup literature of Steve Blank, Bob Dorf, Eric Ries, et al. The idea is not to solve for the end result, instead, all projects should take a user-centric, iterative approach of "build, measure, learn" cycles, and create minimum viable products (MVPs) that help inform what the final solution should be. After experimenting with an MVP, a decision should be made to kill the project, pivot the effort, or preserve it (not change course). This is an approach that allows you to learn and personify the

startup clique, "fail fast, fail forward, and fail cheaply." Note that most people forget the final "fail."

Another tool that underpins the lean startup approach is design thinking. Design thinking is a methodology that encourages truly understanding the problem, empathy for the stakeholders, creating various solution options, and taking an iterative approach. While there are many tools and approaches that scholars could use to analyze and write papers on why the Travis Innovation Office was a success (or not), the key thing that the initial team wanted to accomplish was execution. Instead of admiring the problem and solving for the enterprise's pragmatics, the goal was to get many projects going with full recognition that the majority of them would fail. This up-front acknowledgment of failure was another key to success.

TAKING A VENTURE CAPITAL PERSPECTIVE

From the very beginning, the Travis Innovation Office set expectations that they would try many activities and most of them would fail. However, the successes would provide non-linear upsides and return at a rate well beyond the initial investment of time and money. A "net benefit" from the office would emerge.

At a high level, this is the approach the venture capital (VC) community takes when investing in startups. VCs structure their investment portfolios with many different companies. While the investment in any one company will probably fail, the one or two companies that are successful will return many multiples above their initial investment. Additionally, VCs will have funding (and the right to) add additional capital to the "winners."

If we look at what happened at Travis starting in early 2016, the innovation office was a bootstrapped startup that was trying to prove value to its early investors (i.e. the local leadership). Out of the gate, Airmen worked on

these efforts on their own time and without funding. In 2019, the Travis Innovation Office (now called Phoenix Spark) has evolved to include an assigned workforce of a permanent civilian, one officer, and two enlisted members. Additionally, they've received funding for efforts exceeding $5M and are executing projects with strategic implications with partners from Silicon Valley, the program offices, the research labs, and joint partners.

DON'T TRY TO BUILD THE KINGDOM, INSTEAD CREATE LOTS WHERE OTHERS CAN BUILD THEIRS

The biggest risk to Travis's innovation model was its sensitivity to changes in leadership. In the military, unit leadership rotates approximately every two years. Similarly, the core team of an innovation office will eventually move to different assignments. So how does the current team empower the next generation of Airmen intrapreneurs with the flexibility and latitude to innovate without being burdened by the traditional system? A chance opportunity for Phoenix Spark presented itself in 2017. The AMC Commander, General Everhart was visiting Travis Air Force Base on a site visit and leadership wanted the innovation office to present for fifteen minutes of this time. The innovation team took the first ten minutes to deliver good news filled with partnerships and projects with OSD, startups, and universities. Before launching into the last five minutes, there was a "questions" slide and the team looked at General Everhart, "Sir, what do you think?" General Everhart nodded his head and said, "I like this."

With that "signal," the team launched into the next slide titled "The 4-Star Challenge." The team had embedded a hidden slide that would only be presented if General Everhart seemed interested in this grassroots innovation model. The briefing continued: the team wanted to test the model and pursue projects that were top-of-mind

for General Everhart. In one month they wanted to turn around project plans that included cost, schedule, and performance and present the results to him at AMC Headquarters. Without missing a beat, General Everhart wanted solutions for an autonomous K-Loader, an automated logistics center, cloaking for mobility aircraft, and a new data-link system. Over the next month, the team organically grew from across the base. Airmen, on their own time, pitched in and contacted over 50 organizations across the country (both DOD and non-DOD), developed 12 project plans, and found funding and contracting vehicles for execution. This anchoring challenge gave the innovation office more legitimacy and more people came out of the woodwork to help out.

KEEP IN MIND THAT NONE OF THESE AIRMEN WERE TRAINED INNOVATION PROFESSIONALS

Instead, you had a Coalition of the Willing taking a "how can we get to yes" experimental approach to solving some wicked problems. One of the more compelling opportunities came from a professor at the University of California Berkeley who wanted to take on the autonomous K-Loader problem. In their project plan, he and his team said they could take a legacy K-Loader and make it fully autonomous for approximately $2M over a two-year time frame. Contrast that with a similar Air Force project that had the same end goal in mind... but had been bureaucratically constrained and was expected to require four phases over eight years and cost $5 million just for Phase 2. This innovation team had uncovered real opportunities and broadened the solution space for the Air Force.

With these results, two members of the innovation team, accompanied by the Travis Wing Commander, went to AMC HQ and briefed the results to a room full of General Officers and SESs. In the first half of the hour brief, they

presented the results of their one month sprint which included solutions rooted in augmented reality, robotics, autonomy, AI/ML, and even design sprints. But then came the second half of the brief, the message that the Travis team really wanted to drive home:

> "Travis's Innovation Office is not unique...other similarly empowered Airmen could do the exact same thing."

That is when they unveiled Phoenix Spark, AMC's grassroots innovation program that would empower other bases to grow their own Spark Cells across the MAJCOM. General Everhart looked at his table of General Officers and said, "I want this." Over the next three weeks, AMC headquarters and the Travis Innovation office created a document that chartered Phoenix Spark as an official effort across AMC. General Everhart signed that document and became the first General Officer to endorse the Spark model.

In parallel, out of the Pentagon, a team was creating the innovation organization that would become AFWERX. That team reached out to Travis AFB's innovation team and wanted to include the Spark model as part of the AFWERX program. Under an agreement of semi-autonomous operations, the Travis team agreed to merge the Spark model within the broader AFWERX umbrella. VCSAF who approved of AFWERX and Spark was elevated to a program that had Headquarters Air Force support.

Now with top cover occurring at the very top of the organization, it was time to grow the Spark model and create a decentralized network of base-level innovation cells. Initially, there was a question from the Pentagon: Should we grow Spark by creating a standard structure and mandate that every Wing have a Spark Cell?

We at Spark, and in harmony with AFWERX's "authentic growth through supply and demand matching of value,"

reaffirmed that innovation duties are not something that should be prescribed or directed. If a Spark Cell is truly value-adding, other Airmen will see it and want to start a cell at their base, in a non-standard way, suitable to the environment and personality of the particular base where they served. Innovation is many things; uniformity is not one of them.

SPARK IS A TEAM SPORT

As the Phoenix Spark was chartered by General Everhart in Air Mobility Command and the Spark concept was brought in as an original AFWERX capability, it was time to give these Spark Cells real teeth. How do you go from individual tactical-level innovation cells and then align them into a lateral distributed network with the strategic capability? How does local activity create value to the whole—should the Spark Cells try to be adding strategic value? Are Spark Cells duplicating efforts of the traditional structure?

As an opening response, we would like to borrow a line from any grassroots effort:

"Think globally; act locally."

By addressing the problems that affect the local mission, Airmen are creating capability at the edge. They are addressing pain points that might be too small or localized for larger muscle movements of the system to act. However, as with the case of Brett Turner who wanted to solve the problem that he encountered every day, some of the Spark solutions will create strategic capability. In many respects, some of the issues that tactical-level Airmen experience uncover deeper systematic issues and help broaden the enterprises' aperture about what is possible. Out of the gate, Spark Cells shouldn't be trying for world peace, but their solution may inform what the solution space for world peace looks like.

Beyond Brett Turner, another example comes from a Contingency Response Airman. The Contingency Response Wing's mission is to secure and make airfields operational during wartime and humanitarian operations. As part of this, Airmen have to set up electrical generators to power their self-sufficient operation. A pain point associated with setting up power is driving a nine-foot grounding rod into the earth. Beyond the difficulties associated with physically driving the rod into the ground, they are also required to get dig permits and survey the ground to ensure that they're not hitting a utility line. This becomes problematic in municipalities like Iraq and Syria where local utility officials might not be easily contacted. Through multiple iterations and growing interest in the solution space, the project pivoted to an updating of the military generator that hadn't been significantly improved since the Vietnam War. The project turned into a "mobile generator" concept that shrunk the generator footprint by 75%, had fewer fuel requirements, and enabled more equipment capacity to the overall response package due to the space-saving. Additionally, since the Army is the lead service for power generation, the generator project turned into the Joint project (more than one US military service involved) that had overwhelming support. Note that the original Airmen who broached the topic just wanted to make things "suck" a little less and create a ground solution. Through iterative investigation of the problem and the solution space, what started locally, turned into a joint project with strategic implications for the DOD.

Spark Cells do duplicate some efforts because the Air Force already has established organizations solving some of the problems. However, they aren't resourced to tackle the small, everyday problems that would never even make it on a priority list. For these problems, Spark Cells are the best positioned to rapidly address and provide the problem owner with pathways to solutions. In other cases, yes, Spark Cells are working on something

that some other organization is working on; to this point, we must not worry and play on. Having multiple teams work on similar efforts happens all the time and it should be viewed as a way to increase the probability of global success. Too often, organizations put all their eggs in one basket and success depends on a single investment. Duplicated efforts, especially at the dollar amounts and non-traditional approach Spark Cells may take, nullify concerns of wasted resources; especially considering the intangible gains created by local empowerment and cognitive expansion of Spark Cell participants.

Spark Cells should and do partner with any organization that will add more value than they take. While this calculus may seem like a no-brainer, this is easier said than done. While any organization that wants to help should be considered, there is no free lunch with any partnership. For example, if an organization wants to fund an entire project, does it also come with burdensome and unrealistic reporting requirements and status updates that sap the entire Spark Cells bandwidth? If an organization wants to take on the entire project, do the intrapreneurs lose creative latitude and the user-centric focus?

The unsatisfying answer is that you don't know if a partnership will prove a force multiplier or if it'll fall flat. But Spark Cells need to understand that the majority of projects take a team to execute and that partnerships are necessary. A model we consider for vetting projects is the AFWERX five-factor model discussed in the Mission Lead lessons learned chapter. Some of these five factors could be the same person or organization, and all of the people may not be known during the initial stages of a project and the people may change throughout the project. This is just a guide, it does not guarantee project success, but it increases the probability of success.

Risks, Roadblocks, and Mitigation: No project comes without risk and roadblocks. These shouldn't be seen as

reasons not to act; you must understand, there is also a risk of inaction. Instead, risks and roadblocks should be identified so you understand the landscape of the issues you'll face as you pursue your project. This could include a regulation, an Air Force Instruction, local policy, an ill-tempered colleague, etc. Then you should think about ways to mitigate these risks. This is where leadership support is key; they have the ability to accept a reasonable risk and remove roadblocks for your project.

Finding Symbiosis: How Spark Leveraged Strategic Partnership: The Travis Innovation Office could have existed without support from the MAJCOM or from AFWERX; however, in order to operate with continuous flexibility and increased resources beyond the tenure of the core team and local leadership, these partnerships mitigated risks against turnover and increased the credibility of the grassroots activities. When forging partnerships, consider (empathize) with the other party. What are they trying to solve for; what pain points do they experience; and how you can add value to their missions. More often than not, the two Venn diagrams overlap to some degree and you can create a symbiotic relationship that provides a tailwind to both parties. The Spark/AFWERX partnership was created over the proverbial (and literal) backside of a napkin at Reagan International Airport. AFWERX (then by a different name) had not yet formed and Spark had just been chartered by Air Mobility Command. AFWERX was looking for a way to tap into the demand signal of Airmen and Spark wanted to get credibility and resources outside of AMC. A gentlemen's agreement and a handshake sealed the relationship and Spark became an initial capability of AFWERX.

Another key partnership for AFWERX (and by proxy, Spark) was with Small Business Innovation Research (SBIR). A team from AFWERX partnered with the AFRL and the Air Force's SBIR office to increase tap into a broader set of technologies and increase the volume of awards. In this case, the SBIR office needed a way to

attach more applicants and AFWERX wanted to bring more vendors and innovative technology into the Air Force. The partnership created the SBIR Special Topic for Dual-Use technologies that were centrally contracted and funded, but project management was distributed to various offices. Spark Cells were key partners for this model as you had an established network of innovation cells that wanted access to funding, contracting, and innovative technology. With this strategic partnership, the Air Force has been able to bring in over 1,000 companies on government contracts and give them a reasonable opportunity to explore product/market fit at all levels of the organization.

NO ONE WANTS TO EAT VEGETABLES

Reasonable people can disagree on the value of Spark. From the very beginning, the goal was never to create a decentralized network of semi-autonomous innovation cells that would create optionality for the enterprise and strategic capability. Instead, Spark took a non-linear path for its formation, traveling along with a series of hypotheses and experimental results. So, if you expand upon the Lindy Effect, which can lead to the conclusion that an organization is always at the halfway point of its lifespan, our current age of the Spark mission suggests that it only has as many years to exist. This lifespan outlook can create concerns that grassroots innovation is on the decline. If you consider that the Airmen at Travis Air Force base banded together in early 2016, as these words are written, Spark should last until 2024 (according to a Lindy Effect lens). This is why you have to go back further and consider that grassroots innovation is not a concept that was inspired by Ash Carter in 2015; instead, you must look the Billy Mitchell's, Jimmy Doolittle's, and John Boyd's, the intrapreneurs of their time, and understand that the concept of innovation is within the very institutional fabric of the Air Force. From the very

beginning, our leaders have been disrupters. The Air Force has always had forward-thinking trail-blazers who have enabled us to break the sound barrier and create stealth technology. It was the Air Force that fortified space and created a strategic warfighting capability by leveraging the ultimate high ground. It is Airmen that led us into the cyber age and created new organizational agility through DevOps.

Any Airmen that participate in Spark or the broader innovation ecosystem need not burden themselves with understanding the global impacts of their intrinsic motivation to find the next solutions. Instead, they should just find a nibble of the elephant that suits them and find solace in the fact that they're making things suck less.

"Men Wanted: for hazardous journey, small wages, bitter cold, long months of complete darkness, constant danger, safe return doubtful, honor and recognition in case of success."

Virtual Tools

Spark
Tank

AFWERX
Spark

**Virtual
Tools**

Major
Commands

Senior
Leaders

PATH OF OPPORTUNITY

> " Because innovation starts with people... "
>
> RAZOR

THE PURPOSE OF VIRTUAL TOOLS AND ECOSYSTEM DEVELOPMENT

To bring together innovators through virtual and in-person opportunities, further unleashing our Air Force's innovative capabilities.

A BRIEF HISTORY

When AFWERX was being formed, we knew that we would need to help the Air Force increase our connectivity within the Air Force as well as with business, academic, and other government organizations. We dedicate time and resources to do this with web-based tools and in-person engagements (i.e., conferences, panels, visits).

KEY HIGHLIGHTS

In our first two years, we grew to:

- 161 distributed team members, 14 group inboxes, and 99.9% uptime, allowing for real-time collaboration and automation

- 28,000 virtual collaboration users, 3,500 ideas, 400+ projects underway (SIF, SBIR and Campaigns)

LESSONS LEARNED & INSIGHTS SHARED

If you want to build real partnerships: Talk is nice; Action is better

Building partnerships in the military requires building personal relationships beyond your own organizational team. We have devoted time, not as much as we would like, to know other innovation organizations' needs and desires. Even if your organization's mission statement and job titles sound the same as another's, it is not going to be an instant marriage of integrated interests. Courting, engaging, and aligning priorities are all things that still need to happen to form deeper partnerships. AFWERX has built its brand off of the sweat and toil of its members, and we took the time to build relationships with other innovative people as well, and then often tried to go a step further to define a simple project or a way to work together that took our programs and partnerships to the next level.

For example, consider our evolving partnership with the National Security Innovation Network (NSIN), which was named MD5 when we first met. After some initial

meetings, our next step to foster our relationship was to try and work with them and next to them—in the same office building. Proximity would be key. We discussed moving closer to each other's offices, and as it turned out, they moved next to us—same floor, and in the adjacent offices.

The benefits were many. When you are close to someone, you get the chance to have the day-to-day collisions, which turn into conversations. With AFWERX and NSIN personnel in the same office location, our people started talking about the projects that they were working on, as well as the barriers that they were facing. Yet it was not all mission talk. Numerous times our close proximity opened the opportunity for a few minutes of water cooler talks, laughs, and the deeper, authentic sense of familiarity that builds trust, and trust is the fundamental building block of partnerships.

When engaging with NSIN, our mission sets aligned at a high level, yet our execution and audiences differed. Each of our organizations had different programs and opportunities, but we found common pain points. In order for the AFWERX and NSIN relationships to grow, it took people on both sides to commit to mutually beneficial projects. The AF Maker program, a tech development team, and more projects came to life in large part because our two organizations were in close proximity and we created alignment through our higher contact time and positive relationships.

The partnerships we have created with our sister organization were in alignment with our respective missions. As NSIN sought to build the industrial base in conjunction with universities, there were projects that came to mind, yet the challenging roads ahead for those projects were to get funding and to be able to prototype with their government customer. NSIN recognized this and partnered with AFWERX to try using the new SBIR

and STTR open topic process as a vehicle to connect the students and DOD customers with real funding and growth opportunities.

IT IS EASY TO CONNECT WITH POTENTIAL COLLABORATORS; THE FOLLOW UP IS HARDER

We live in a day and age where Americans want to contribute to the national security mission. When we started AFWERX, no one knew or understood our brand. AFWERX would include an innovative experiment in changing the message of how the Air Force can work with industry. Dozens of innovation organizations across the Air Force, DOD, and Federal Government have been launched. This is a good thing, as the Air Force and the DOD total over 3 million people! Within the DOD, the separate organizations cover a vast group of mission sets and having an innovation organization stand up to help that mission set transform for the digital age and adversarial conflict is a great thing. That is how change management is successful across a large organization. At the same time, sharing your identity within a growing organization can be confusing to outsiders.

As a case study: Community outreach opportunities were abundant in the dynamic "startup city" of Austin, Texas, where we based our AFWERX-Austin operations. There was no shortage of networking events or panel speaking engagements. We kept the message simple: Connect innovators; Accelerate results. AFWERX had support from senior Generals in the Air Force, and this plus the Air Force brand opened up a lot of doors for initial meetings with Fortune 100 companies, top Venture Capital firms, and community leaders. The public is generally excited about being able to contribute to the black box that is normally the DOD. Communicating simply, repeatedly, and with simple to understand, executable next steps (with real contracting vehicles

and 30-day deliverables) is what moved the needle for building relationships with "non-traditional" companies (business large and small that had not previously worked with the government or military).

The Austin team usually engaged in about three events per week outside of office hours. These events attracted anywhere from 50-125 people each week. The defense innovation movement is alive and well, and the issue is not the lack of exposure, interesting events, or the right caliber of talent—it's the proper care and feeding of the leads that are attracted during such events.

The follow-up questions, explaining how things actually work, is what takes up the majority of the time. The "inbound" part is easy. The AF and AFWERX are working to change the whole process of how companies work with us. Although this has not been solved yet, we are still in the middle of transforming how we work. During this time, the companies, founders, investors, and partners we bring in have a lot of questions about how things actually work. We gladly provide them high engagement, even hand-holding at times, through our processes. In order to do this as we scaled to a larger network of connectivity, we had to transition from one-on-one meetings to hosting webinars explaining who we are and what we do to anyone who wanted to join. These became our "Ask me anything" sessions. Although they cannot be as personalized as a one-on-one encounter, they provide a satisfactory exchange of information and a chance for anyone to have their questions answered. We do program management at scale by using Zoom webinars.

LEVERAGING VIRTUAL TOOLS

We have partnered with commercial companies to host an internal ideation (ideation: developing an idea of its concept into reality) platform. The Air Force had been performing Ideation without a platform, without a way to consistently connect, ideate, and tell stories. As

of December 2019, we have a platform with 28,000+ people, we have over 3,500 ideas, and are creating engagement with inspiring people and their stories!

START SMALL, STAY AGILE

Avoid long term projects when you get started. There will be lots of high ranking people who will want you to solve problems for them. Unless they are your direct champion or are giving you people AND resources to tackle the issue, it will dilute your mission capability as well as your chance to build community.

The doors of opportunity stayed open and led to meaningful relationships because our team delivered multiple, early small wins for our customers—warfighters and their supporting organizations. These small wins paved the path for larger ones.

Keep the intense focus on adding value. Experiment, kill cheap non-productive efforts often, rally behind the success, and be delivery-oriented.

DESIGN A SYSTEM TO ENGAGE, CAPTURE, CONNECT

Engagement is defined as the quality of a stakeholder experience that emphasizes the positive aspects of the interaction with the organization. Stakeholders are the Airmen, partners, and companies within the ecosystem. Often broken down into personas, stakeholders are the people. It is the sum of all individual efforts that make up the ecosystem and this is what drives innovation.

AFWERX capabilities are interdependent and each designed to connect stakeholders that create value on all sides. Our tools are designed to help a user understand the ecosystem, identify nodes or connector people,

and give stakeholders the opportunity to leverage the network to support their goals or projects.

We strive to communicate value about AFWERX capabilities and design pathways for stakeholders to engage. We seek to create value networks that are clear with easy to understand calls to action. We also tried to design a system that is easy to navigate to include a website that is ever-evolving (please see www.AFWERX. af.mil). A few questions for reflection:

> What does the "front door" to your organization look like?
>
> Is it easy to access?
>
> What is the experience like once you enter?
>
> Can you access the resources or tools you need to advance your idea or solve your problem?

IT IS HARD TO FOLLOW UP ON PROMISES

You must realign resources when things are scaling

What is the biggest challenge with creating so much "inbound" energy and ideas? You need to acquire additional resources to scale your efforts!

To do so, after your first win or two, ask leadership to realign resources to help your organization scale— this doesn't mean that your innovation organization needs to grow. Avoid continued growth unless you are spending the necessary time and energy to build your backend support system of technology. An organization's reputation matters, and it's your follow-through with people and an explanation of how things work that matters to keep companies working with the DOD long-term. If you lack the technical tools to help organize and communicate with all of the stakeholders, your effectiveness will suffer.

The outreach messaging we promote is that AFWERX has the ability to connect Airmen intrapreneurs with researchers, thought-leaders, cutting edge companies, and other experts by using accelerators, public challenge events, and targeted outreach. We speak about how the Air Force is looking to put emerging technology into the hands of our warfighters rapidly and we talk proudly of our Small Business Innovation Research (SBIR) metrics over the past year. Our mission has led to a number of great requests for more information from many people.

Public interest and engagement is strong, but the number of follow-up requests that come from our outreach efforts is increasing at an exponential rate. The number of inquiries generated is quickly becoming overwhelming for our small team to manage effectively, and proper communication is increasingly more difficult.

It is worth repeating: one-on-one meetings are not sustainable for any large scale operation. At AFWERX, we transitioned from having these one-on-one meetings to performing a weekly call with groups of companies and having a Frequently Asked Question (FAQ) capability to answer the basic questions that come in repeatedly. We also created easier pathways for companies to get "on contract" and help us solve problems.

The defense innovation public storefronts are revolutionizing our Nation's defense industrial base. This type of disruption has many advantages but also brings along with it much scrutiny. We can shape the story through excellent customer service and engagement, but meeting the large scaling effort with our smaller initial team has been challenging.

DATA MATTERS. WHAT'S YOUR STORY?

Community building, ecosystem development, relationships, or whatever you want to call "it," tends to

be centered around individuals on a team. In order for that to scale you need to have a central database of information and relationships.

THE DOD SHOULD CONTINUE TO EVOLVE HOW ITS PEOPLE AND PROCESSES WORK AT SCALE

The personnel systems that our organizations have built are challenged to react to modern-day challenges. There is a blend of technology and people that can scale efforts. The advantage of being in government is that AFWERX has been able to bring people into the fold of doing related work, without standing up new positions or changing where people stay and work.

AFWERX officially has about a dozen full-time government team members. However, unofficially, AFWERX has over 170 people working across the world on projects related to AFWERX. Questions that we consider almost daily:

How do we encourage people to work in the same way?

How do we solve for yes and get things done?

We created our own processing of team members to focus on our values, our tech tools, and how we work/share information. Our organization seeks to be extremely transparent in how we are budgeting items, how we are sourcing efforts, and what people are doing to solve for yes.

This raises another point about being a unique culture (for now) within a large organization—be careful of your organization's culture. As the organization grows, there needs to be time and effort spent on reinforcing your core values. The DOD is a large organization and people come with different experiences. An organization needs

to keep fostering alignment as it is growing, but also remember its roots and core values.

STAKEHOLDERS' NEEDS AND PERCEPTIONS WILL CHANGE

This is inevitable based on market conditions, capability expansion, process improvement, etc. Even if you think you know your stakeholders, they are constantly evolving. By creating a pathway for team members to receive stakeholder feedback, we can continuously develop processes and communication that reflects the changing needs of our customers, reducing friction, increasing conversion, and therefore optimizing our efforts.

SEND YOUR PEOPLE TO THE FRONT LINE

The role of ecosystem development is more than just expanding the reach and creating relationships, it is about understanding their needs and their perspectives. By attending conferences and visiting organizations, your front line innovators have a unique opportunity to converse and ask questions in order to understand gaps and opportunities for any mission's communication or capability offerings.

BE STRATEGIC WITH YOUR STAKEHOLDER ENGAGEMENT

Define a strategy, qualitative and quantitative, asking:

Who is accountable and responsible for these efforts?

How much and how often will team member(s) be dedicated to this effort?

Identify and prioritize capability areas that may be suffering.

What is your benchmark?

What metrics will be your basis for success?

Create and agree on an effective feedback loop and reporting frequency with your team members.

Identify and attend events where your stakeholders will be present; network.

Schedule calls and interviews with key stakeholders.

Structure and deliver surveys strategically to optimize conversion.

Leverage survey tools to collect feedback from a larger sample size.

TELL YOUR STORIES OFTEN

Uncover the theme around each story and tell it cohesively. Highlight and send stories out early, as it allows you to shape the narrative if you get out in front of the communication cycle associated with a project. Avoid waiting until later to collect information on what is working and what is not working.

PRACTICE WHAT YOU PREACH ON ACCOUNTABILITY

We have to hold people accountable in the Air Force. It is not something we traditionally do except in an OPR or EPR. At AFWERX, we set goals and report on them to each other during our Common Mind gatherings (our quarterly nation-wide meetings, two in-person, two virtually).

At the same time, trusting your people is what counts, and AFWERX has demonstrated that giving talented teammates space, time and top cover can produce extraordinary results. It's unusual in our government to give tremendous latitude to mid-level officers, enlisted, civilians, and contractors. With some vision, direction and a "can do '' attitude, AFWERX has shown how a small team can make a meaningful impact in transforming an organization.

We need to reorganize how we do business as a government in order to foster the growth of more agile teams. The hierarchical and rigid structure of the DOD works well with some environments (e.g., battlefield operations), but will not work in a world where the speed of integration is prime. The age of integration requires more agile teams to be the ones driving the direction and vision of an organization, solving for yes and with a #GSD Attitude.

The AFWERX team is comprised of folks who focus on solving for yes, people who will take the time to deep dive into a topic, read about it, talk to people and jump in to share creative ways of solving a problem.
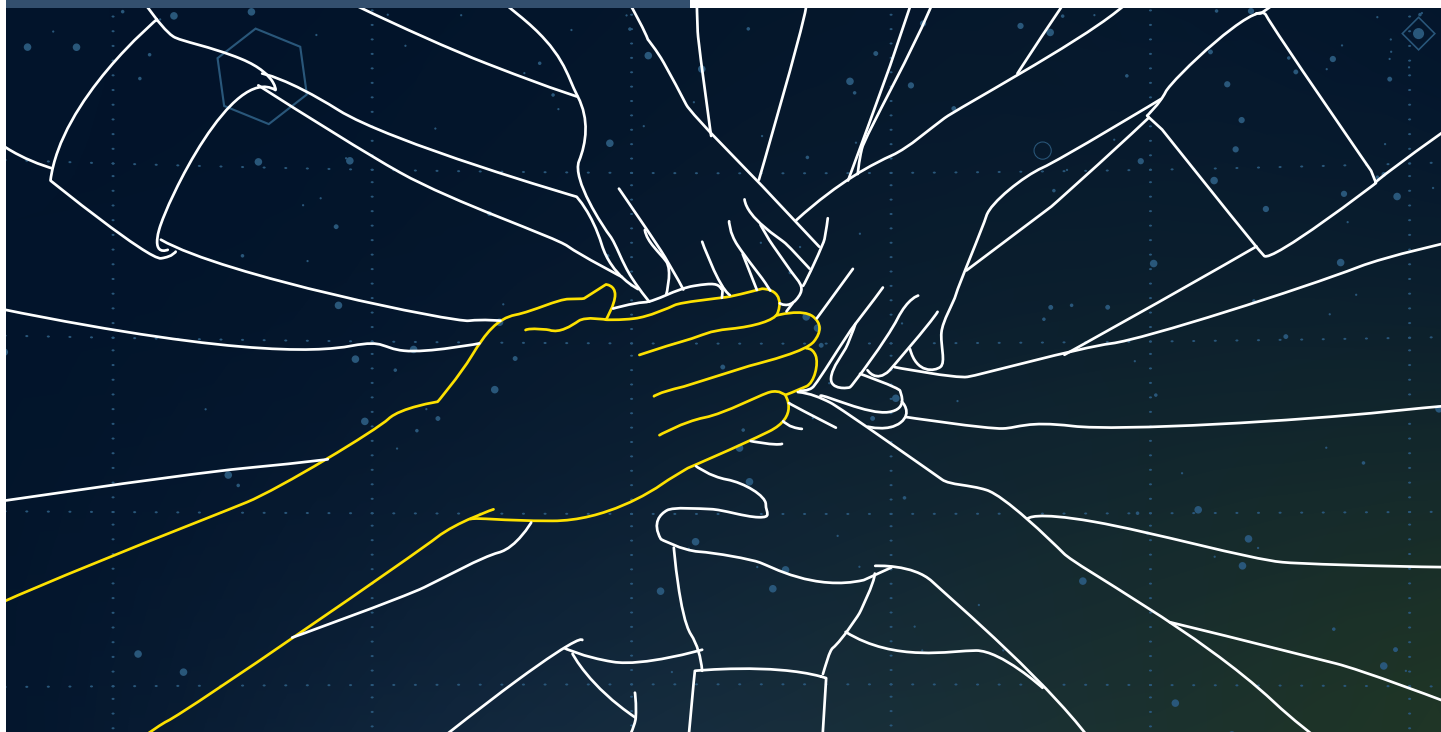
CONCLUDING THOUGHT

Innovation takes a team. Fostering growth in an ecosystem requires consistent messaging, actionable results, and deep engagement.

"Because innovation starts with people..."

Major Commands

Spark
Tank

AFWERX
Spark

Virtual
Tools

**Major
Commands**

Senior
Leaders

PATH OF OPPORTUNITY

PART 1: UNCOVERING IDEAS AND OPPORTUNITIES

Major Commands /// Craig "Yogi" Leavitt, Col (ret.) USAF

"
In theory, there is no difference between theory and practice. In practice there is.

YOGI BERRA
"

THE PURPOSE OF THE MAJOR COMMAND (MAJCOM) INNOVATORS

The purpose of the MAJCOM Innovation Program is to scale innovation efforts across the majority of the operational Air Force. MAJCOMs were chosen as innovation organizations for several reasons. First and foremost, MAJCOMs are responsible to organize, train, and equip the Airmen of the US Air Force. Second, they are responsible for supplying forces to the Combatant Commanders across the globe. As such, MAJCOMs represent virtually all USAF Airmen and support the development of the majority of capabilities necessary to meet the USAF responsibilities toward joint force warfighting. Our MAJCOM Innovators capability provides a true cultural change among Airmen who are willing to work beyond the traditional stovepipes of MAJCOM hierarchies by empowering them to rapidly solve problems.

A BRIEF HISTORY

In order to create true cultural change, it is necessary to reach the maximum number of Airmen. In the US Air Force, the MAJCOM, or 'Major Commands' are the uppermost hierarchy of the organization and they include virtually all Airmen across all mission areas. USAF MAJCOMs include; Air Education and Training Command (AETC), Air Force Material Command (AFMC), Air Combat Command (ACC), Air Force Global Strike Command (AFGSC), Air Mobility Command (AMC), Air Force Space Command (AFSPC)*, Air Force Special Operations Command (AFSOC), Pacific Air Forces (PACAF), United States Air Forces in Europe (USAFE), and Air Force Reserve Command (AFRC). *Note: After the inception of the MAJCOM program, Air Force Space Command (AFSPC) became the sixth branch of the US military, the United States Space Force (USSF).

This MAJCOM innovation program was designed to support all of the innovation programs and products described in this book. The goal of creating the MAJCOM innovation program was to scale the innovation demand by educating Airmen on the programs available, and providing leadership, mentoring and coaching toward using these programs to achieve individual MAJCOM needs as well as combining resources toward shared objectives. Ultimately, the objective was that each MAJCOM would begin the process of developing an enduring innovation program, with the knowledge and expertise to sustain efforts toward these and other developing activities within the innovation ecosystem.

KEY HIGHLIGHTS

The program was designed in the Fall of 2018 and organized and scheduled in the first two months of 2019. MAJCOM representatives were identified and ultimately traveled TDY to the AFWERX-Vegas Hub to begin the process of developing MAJCOM specific innovation programs, as well as create lateral communication pathways between organizations that would help them identify areas of common interest for collaboration.

LESSONS LEARNED & INSIGHTS SHARED

It is difficult to institutionalize new innovation programs within large organizations

The AFWERX approach and methodologies are designed to create lasting change and are very different from more traditional approaches that have defined progress in large organizations like the USAF. As has been proven in countless examples in the past, adoption of these different, lean startup-like approaches can be problematic and disruptive. While progress may be slower than hoped, it is nevertheless very powerful and can have immediate effects on the organization. However, this progress is tenuous and must be nurtured until the new approach to innovation transitions from a curiosity to a well-supported and enduring program.

ORIGINS OF THE MAJCOM PROGRAM

Initially, a rough template for MAJCOM innovation was developed through cooperation between AETC and AFWERX in the early days of AFWERX by developing AFWERX-Austin as a joint endeavor. Additionally, AETC had taken early and significant steps to formalize an innovation program that embraced many of the same approaches to innovation as AFWERX. Through the

establishment of the AETC Technology Integration Detachment (TID) as a separate operating location in Austin, they began a reorganization process to formalize innovation efforts within the command that could be modeled as a rough template for other MAJCOMs.

The AFWERX MAJCOM Innovation Program was envisioned as a Minimum Viable Product (MVP) using a lean startup approach, and as such was intended to start small and validate a set of assumptions that guided the design of the initial program. Based on the results of the first calendar year 2019 (CY2019) efforts, the program was selected to continue and has been adapted to grow into a follow-on effort for CY2020.

Each participating organization was expected to take part in the program as defined by the four pillars of Organize, Prioritize, Integrate, and Invest. More specifically:

Organize: develop an internal organizational structure to support innovative efforts of Airmen across the command.

Prioritize: design a process that takes ideas from all Airmen, then prioritizes and resources the highest potential ideas.

Integrate: create strong internal and external communication pathways to increase collaboration and leverage shared resources toward common problems.

Invest: contribute the financial and human resources necessary to achieve these goals using modern innovation tools and processes.

EXPERIMENT TO BRING TOGETHER INNOVATORS

Participating organizations for 2019 were to send a representative to AFWERX-Vegas for a 90-day cohort experience to begin the process. As an experiment for this MVP, the minimum viable number of participants was

targeted as three MAJCOMs. Through the coordination process, however, all 10 MAJCOMs made the decision to support the program, along with two additional large organizations—the Air National Guard, and AFNORTH which is both a Numbered Air Force (NAF) for Air Combat Command and the Air Component of NORTHCOM. In the end, participants from 12 large organizations descended upon AFWERX-Vegas for three months from April until June 2019. During the course of the 90 days, two of the organizations dropped out of the program, leaving a total of 10 to complete the 90-day program.

Additionally, the Air Force Warfighting Integration Capability (AFWIC) and the Air Force Installation and Mission Support Center (AFIMSC) joined the group on a part-time basis. In particular, as an integrating organization that supports Airmen across all the MAJCOMs, AFIMSC has developed a strong 'MAJCOM-type' innovation program that is effective in supporting Airman innovation efforts.

The MAJCOM MVP experiment was built upon three assumptions: First, through focused immersion into all of the AFWERX programs and capabilities, the value and opportunities would be readily apparent, and the liaisons would quickly see opportunities and begin using the tools; Second, co-location with the team at AFWERX-Vegas would result in the rapid development of strong relationships and the leveraging of in-place expertise; Lastly, the liaisons from the various MAJCOMs would self-organize into a cohesive team as defined by Tuckman's four stages of group development (Forming, Storming, Norming, Performing).

For the first 45 days of the program, a deep immersion led to all attendees participating in almost every program offered or supported by AFWERX. These events included a dedicated Spark Conference, the Fusion MDO Challenge Definition Workshop, a SBIR workshop, a Spark Tank one-week prototyping sprint, a contracting

workshop, a Public Affairs workshop, an AETC ATID workshop, an Ideascale workshop, and several days of face-to-face discourse with AFWIC, DIU, and MD5 (now NSIN).

Ultimately, all three of the initial assumptions were not as foundational as initially hypothesized. First, even with the heavy immersion to all AFWERX products and capabilities, the liaisons could not easily apply these capabilities to the problem sets of their home organizations. Second, the liaison team was largely focused internally within their own group missions, and as a result, their connected leveraging of the expertise at AFWERX-Vegas, both resident and transient, was not optimal. Finally, the group did not fully self-organize at the speed necessary to become a cohesive and high-performance hybrid team. So much for the theory.

As with any lean startup, an incomplete success does not invalidate the vision, but rather indicates the need to pivot to a different approach in the next evolution of the project. Additionally, despite these challenges, the cohort made significant progress and initiated a wide array of new projects and programs which will have lasting effects on the USAF. To best affect the desired USAF-wide culture change, it will be important moving forward to continue to develop these innovation programs aimed at operational organizations.

There were numerous challenges with the first cohort. First, 12 organizations were too many for the first iteration of an MVP. It was not possible for one person to maintain close integration with 12 different organizations while at the same time mentoring the cohort of liaisons. Additionally, as is often the case in a military organization, some of the participants were selected based upon convenience and availability. Unfortunately, within this dynamic and ambiguous environment success relies on a unique capacity to push forward in

an uncertain environment, and not all participants were equally equipped with this spirit.

Next, the concept for a 90-day continuous TDY limited productivity and separated USAF members from their families for too long. In many cases, the liaisons were 'out of sight, out of mind' and could not connect well with the home organization. Also, there was an unnecessary time compression associated with the end of the 90-day period. Even though the group was co-located at AFWERX-Vegas, the collaboration between the liaisons and the AFWERX-Vegas staff was less than expected (perhaps more structured interaction would have been more productive). In general, a combination of many factors contributed to marginal results in producing the group's self-determined "deliverables."

However, despite the challenges above, the group produced tremendous results and validated the need to continue the development of operational innovations programs. They instituted a recurring, cross-MAJCOM collaboration group that meets monthly in a virtual format and meets in person on a quarterly basis. They identified seven challenges and secured funding from home organizations to pursue solutions to these problems. Additionally, most of the challenges were developed as a result of a better understanding of common problems, and the group was able to share resources toward executing the challenges.

Each of the organizations made measurable progress toward a more formalized innovation program, some more quickly than others. In particular, AETC, AFGSC, ACC, AFRC, and ANG have initiated a process to develop specific innovation programs and are in the process of manning their initial positions. Also, AFSOC's "Alison Group" innovation program continues to develop and is a key contributing member of the MAJCOM innovation ecosystem. The MAJCOM liaisons helped to create more robust participation with the SBIR

program, brought a better understanding of the AFWERX collaboration website (https://usaf.ideascalegov.com/) to their home units, promoted growth in the Spark program, and ensured more participation in the Fusion MDO Challenge across all the MAJCOMs.

Additionally, the group helped to promote the Spark Tank program and some MAJCOMs took efforts to better formalize and evaluate proposals for the annual Spark Tank program. Then, AFSPC (now USSF) elected to establish an IDIQ to support MAJCOM Challenges, and AFGSC took on a scaled-up culture change project to go beyond the single base examples used at Edwards and Nellis AFBs. As a team, the liaisons supported the first two rounds of workshops for both contracting and public affairs program development. Ultimately, eight AFWERX Challenges were launched by the MAJCOM liaison group as a result of the MAJCOM innovation program. These Challenges will run during FY20 and have the potential to address some of the biggest Air Force and Space Force shortfalls.

AFWERX NEEDED MORE CONCISE VALUE PROPOSITIONS TO DEFINE OUR CAPABILITIES TO OUTSIDERS

It was often difficult to explain our objective set of value propositions to people and organizations both inside and external to the USAF. The lean startup which was AFWERX had been in a rapid state of change, evolving continuously toward a future that remains defined by a common, open-ended vision rather than a definitive end-state. Internal to our organization, we have a relatively clear understanding of the programs and capabilities that we are developing. But for outsiders, it was often confusing as they tried to navigate our fusion of capabilities and understand how participating in these programs could create value for their organizations.

We have been progressing towards a stage where we have established some high performing capabilities and additional capabilities that show considerable potential. We have already made some definitive progress in this area in recent months. Our call center is a valuable tool, and the website continues to improve. We must be careful that through defining our capabilities we do not become stagnant, nor should we strive for perfection, as we will be constantly changing. Finally, routine attention will be necessary to ensure accuracy within our dynamic environment of capability development.

Some have opined that if AFWERX is successful, then AFWERX will eventually work itself out of a job. On the contrary, I believe that if AFWERX is successful, it will be a continuous pipeline for new innovative programs, and as the successful programs mature and are formalized, AFWERX will find the next great approach to unleashing innovative ideas.

CROSS-ORGANIZATION SYNCHRONIZATION AND COLLABORATION IS A VALUABLE AFWERX ROLE

There is a tremendous amount of energy and momentum across the USAF, and also across all of DOD, toward the development of new approaches for creativity, problem-solving, and acquisition. One of the primary goals of AFWERX is to further enable an innovative culture across the USAF. This is exceptionally good news. However, the challenge that comes with so much activity is a difficulty in connecting and weaving together all of these disparate efforts. AFWERX is in a unique position to act as a force for aligning and synchronizing these efforts. The process of developing a trusted brand is underway, and partners have been learning that collaborating with AFWERX leads to a more free environment for the sharing of ideas. Traditionally, military project owners are very protective of their trade-space, but on countless occasions, I've

seen these barriers come down to create a much more productive problem-solving environment.

AFWERX can take a proactive approach to create more of these opportunities. Collaboration can occur within large USAF units (MAJCOMs, Air Components, etc.), between USAF organizations (operational units, acquisition community, test community, support organizations, etc.), across DOD or other government organizations, or between USAF organizations and the commercial sector.

The benefits to the larger USAF are multi-dimensional. First, collaborations through AFWERX offer an ability to share the financial and human resources necessary to solve a problem that cuts across multiple MAJCOMs and organizations. Additionally, the solutions will be of greater quality, and given broader support will have significantly higher chances of maturing into full-fledged, enduring programs. The benefits to AFWERX itself will be greater awareness of DOD-wide programs to create synergies where possible and fill gaps where they exist.

AFWERX can also help USAF organizations develop their internal innovation programs and integrate cross-organizational efforts. The structure of each organization will be different. These differences are necessary to support existing organization roles and relationships, but the actual functions within each organization will be largely the same. These functions should include, but are not limited to:

Ingesting ideas from all Airmen

Prioritize these ideas and develop a needs list

Apply resources to the ideas with the greatest potential

Identify and assign intrapreneurs for each project

Provide Support (Contracting/Legal/PA/monetary)

Provide ongoing evaluation of each project

Promote lateral communications with organizations both inside and outside of the government

Create on-ramps for the formalization of successful projects, as well as off-ramps for termination, should the potential not be realized

Once the barriers are down inside of an Air Force organization, it makes it much easier to enable the lateral communications pathways between organizations, both inside the USAF and outside. It is these connections where participants can uncover common problem sets, and share in the contribution of resources necessary to develop real solutions to the problems in a timely and efficient manner. AFWERX can be a conscious catalyst for creating this internal and cross-organizational collaboration by connecting existing programs and efforts whenever possible.

APPLYING THE LESSONS LEARNED FROM THE 2019 AFWERX MAJCOM INNOVATION PROGRAM FOR 2020

We have identified some recommended pivots, and some to preserve for the AFWERX MAJCOM Innovation Program for 2020. These include:

PIVOT 1: TWELVE ORGANIZATIONS (MAJCOMS AND OTHERS) WERE TOO LARGE FOR AN MVP

Instead of 12 MAJCOMs, we expect to focus on four to six MAJCOMs or equivalent large USAF organizations, with success defined by effective development of functioning innovation programs in two to three of the organizations.

The participating organizations will be selected through an evaluation of several criteria, including:

Level of participation in CY2019 Cohort 1 and associated AFWERX innovation programs

Connection to existing innovation projects and enthusiasm for growing innovation program

Leadership support to develop internal innovation organization/programs/processes

Commitment to an investment of time and people toward these goals

Identification of the right people with a combination of passion, vision, initiative, and risk tolerance necessary for success.

This focus on four to six organizations does not preclude participation by other MAJCOMs or other USAF organizations in any or all of the activities, but rather the effort will be focused on mentoring a finite number of organizations toward a more fully developed coherent program. Once implemented, these programs can then be viewed by others as templates for success.

PIVOT 2: SUPPORT A SPECIFIC SET OF OBJECTIVES INCLUDING

Existing projects defined by cohort 1. These include 2D to 3D modeling, Recruit and Retain, Space Asset Resiliency, ISR for Low Observables, DOD-Commercial Space Partnerships, Global Space Transport and Delivery, and Flying Training Next.

Other existing projects, including the MAJCOM Culture Project with AFGSC

Developing projects with the support of a MAJCOM (including intrapreneur, leadership support, resourced advocate)

PART 1: UNCOVERING IDEAS AND OPPORTUNITIES

Major Commands /// Craig "Yogi" Leavitt, Col (ret.) USAF

A finite set of objectives to be developed by participating MAJCOMs

A list of objectives developed by the AFWERX team

A list of AFWERX Objectives includes, but is not limited to:

MAJCOM Internal Organization Innovation Structure development

Creating a 'Needs List' separate from, but related to, formal requirements

Designing a process for uncovering common problem sets and sharing resources toward solutions

Development of an Innovator/Intrapreneur academic/education program

Outlining the SBIR process for MAJCOMs including participation in the strategic SBIR

Designing a SIF Opportunity Program to develop investment choices for individual units

PA messaging program to define and maintain the value propositions for internal and external participants, and to capture objective metrics and subjective stories of success

Developing a well-defined contracting

(RaPIDX) program.

PIVOT 3: RETHINK THE 90-DAY PROGRAM

Rather than a 90-day continuous cohort, we plan to use a series of focused events across the entire year with pre-set, well-defined objectives and metrics for success of each event.

These events should support the objectives defined in Pivot 2 above. Organizations can send the same, different, or multiple people to each event as necessary, but they need to be plugged into the home organization structure.

This allows for short, productive learning sessions, followed by a period of time to reconnect with the home organization and incorporate what was learned. It will also avoid the 'out-of-sight, out-of-mind' aspect of being gone for 90 days. Additionally, it will expose more MAJCOM personnel to these innovation programs, while providing significantly more cross-organization networking opportunities.

PIVOT 4: MORE FOCUS OF SQUADRON INNOVATION FUND RESOURCES

Focus the MAJCOM SIF resources toward the agreed objectives, rather than spread among participating MAJCOMs.

For 2020, we will use these resources specifically to support the objectives defined in 'Pivot 2' above.

PRESERVE 1: CONTINUE OUR SHARE & LEARN PROGRAM

We will continue to share ideas and learn alongside with MAJCOMs and other participating organizations to improve their four pillars of ecosystem development: organize, prioritize, integrate, invest.

First, we will look to them to design an organizational structure that supports innovation. We don't expect a one-size-fits-all template, but there are specific functions that should be embedded within the larger organization.

Second, we expect MAJCOMs will be able to rapidly prioritize needs and resource key efforts that have the greatest potential payoff for the organization and the USAF.

Third, such integration efforts require developing lateral communication within and external to the organization, and empowering intrapreneurs and support organizations with the responsibility, authority, and resources necessary for success will remain a priority.

Lastly, true innovation requires an investment of time, people, and financial resources.

PRESERVE 2: HOLD TRUE TO THE AFWERX MODEL

We will continue to grow an understanding of the AFWERX innovation model and the key five factors necessary for success. A promising program must have all five of these needs met to ensure the best chance of success.

First, a motivated and passionate intrapreneur or intrapreneur team;

Second, the intrapreneur(s) must have the support of their leadership to devote the time and energy necessary for success;

Third, the intrapreneur must have a resourced advocate who provides the funding and other resources necessary to pursue the objective;
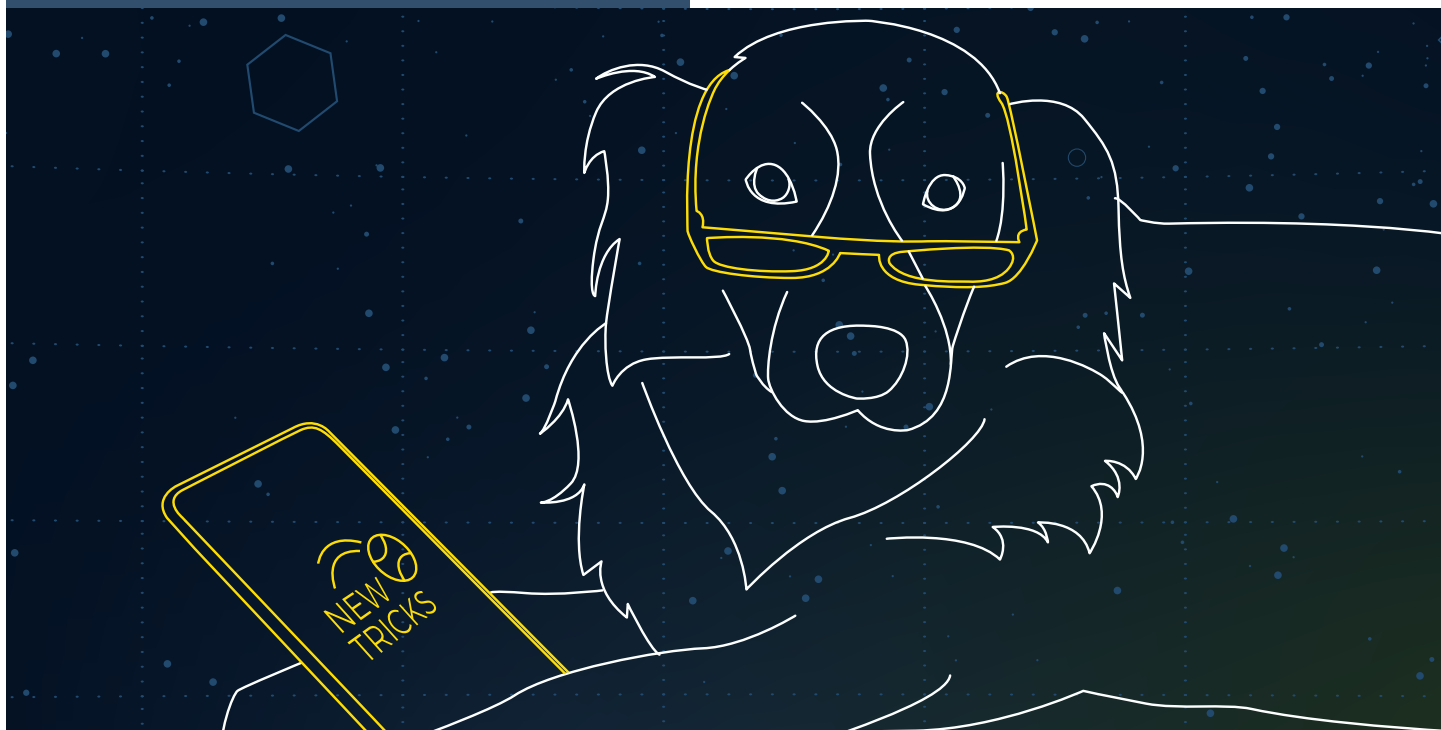
Fourth, AFWERX will help to discover the technical partners who will support the solution; and

Fifth, AFWERX will serve as a resource for contracting, legal, and PA support.

"In theory, there is no difference between theory and practice. In practice there is."

Senior Leaders

Spark
Tank

AFWERX
Spark

Virtual
Tools

Senior
Leaders

Major
Commands

PATH OF OPPORTUNITY

"

It has got to be done, and done quickly, so let's get it done. **"**

GENERAL HENRY "HAP" ARNOLD, FIRST GENERAL OF THE AIR FORCE

THE PURPOSE OF THE SENIOR LEADER INPUTS

AFWERX also responds to senior leader requests, such as perimeter security, JADC2 (Joint All-Domain Command & Control), and Base of the Future innovations.

Within the *MISSION LEAD* section of this book, we noted that:

YOUR ORGANIZATION CAN ONLY RISE TO THE SKILL LEVEL OF YOUR LEADERS

...and that was intended as a compliment to the leaders who helped forge AFWERX's beginnings, as well as a warning to others who are considering starting an innovation mission. Innovation requires its members to have a certain spirit of experimentation and visionary capability because within innovation the number of project losses will likely be greater than the number of wins. However, over time the magnitude of the high-quality wins will outweigh the non-successes of the little cheap losses.

This final section of the "Innovation demand" capability is also the smallest—this single page. AFWERX has

evolved to deliberately seek out "pain points" that need solving at the level of:

Individual Airmen

Squadrons

MAJCOMs

Senior Leaders

Our "Senior Leader" capability was fostered by a consistent, two-way conversation of high investment by VCSAF General Wilson, Lieutenant General J.D. Harris, and other senior leaders from organizations such as Plans & Programs, Financial Management, Acquisition, and AFRL. Their investment included weekly meetings for advice and resourcing discussions during most of the first year and monthly updates thereafter.

As part of our relationship, we work to advance innovation within areas where they have an interest in us performing our low-cost experiments into the Art & Science of The Possible. This has included perimeter security, JADC2 (Joint All-Domain Command & Control), and Base of the Future innovations efforts, which have been pursued using our annual "Fusion" event, which we will explain further in the next part of this book.

"It has got to be done, and done quickly, so let's get it done."

PART TWO
Connecting with
Real Options

AFWERX-DC Innovation Hub

AFWERX Challenge

Allies: NSIN, DIU, SOFWERX

SBIR Open Topics

Innovation Hubs

Tech Accelerators

PART 2: CONNECTING WITH REAL OPTIONS

AFWERX-DC Innovation Hub /// Charles "Top Secret" Perla /// Charles "King Charles II" Snyder /// Derek "Descartes" Martin /// Glen "Reboot" Smith

> ## "Sixty-three percent of all statistics are made up."
>
> SOMEBODY...PROBABLY?

THE PURPOSE OF AFWERX-DC

Create a collaboration space for AFWERX Pentagon personnel, other Air Force members, and partners to connect and engage with industry and academia.

Allow AFWERX capability leaders to make informed, data-driven decisions by delivering timely and actionable data analysis and market research reports.

Create scouting reports to help AFWERX identify and connect with leading technology experts across industry, academia, and non-traditional contributors.

KEY HIGHLIGHTS

190 experts identified in VT-ARC scouting reports ultimately participated in an AFWERX challenge

In the Microelectronics Challenge, companies scouted by VT-ARC made up 26% of challenge submissions and 33% of companies awarded prototyping contracts

VT-ARC data analysis reports used by AFWERX leaders to brief SecAF, Vice Chief, Dr. Roper, Dr. Esper, and members of Congress

VT-ARC's data team was able to generate 40 technology-specific scouting reports in one week using machine learning supported query development

A BRIEF HISTORY

AFWERX-DC was the first AFWERX hub, established in September of 2017. It was formed within the Eastern Foundry startup offices of Crystal City, VA, under a Partnership Intermediary Agreement with Virginia Tech Applied Research Corporation (VT-ARC).

LESSONS LEARNED & INSIGHTS SHARED

Look before you leap; plan your assessment strategy early in order to differentiate your innovation organization's product efficacy.

In the excitement of racing towards progress, an innovator can pursue multiple approaches and products to enhance Air Force effectiveness. However, care must be taken when measuring those innovation products' efficacy and performance. Properly executed, the ability to quantify efficacy might prove especially valuable in justifying a newly stood-up innovation program.

PART 2: CONNECTING WITH REAL OPTIONS

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Improperly executed, poor metrics will damage an innovation program's credibility.

Taking care in defining an evaluation plan is not unique to the innovation sector. Consider the typical acquisition process. With considerable effort, a new capability such as a new aircraft will have measures of performance, measures of effectiveness, key performance parameters, and other factors defined prior to the plane's actual development. Considerable effort will also go into setting the associated metrics.

Despite the care and consideration that goes into these metrics, sometimes the lines between these metrics become broken—a performance parameter might be elevated to a "must-have" status in order to demonstrate a product's effectiveness. For example, while an aircraft's top speed might be important, it might not be the sole factor for accomplishing a particular mission—stealth may be more important. By asking about mission intent, evaluators can better prioritize the importance of exceeding (or missing) a top speed requirement.

We have experienced similar "intent" and metric planning (and at times a lack of planning) journeys as AFWERX has grown. On several occasions, we were asked some variation of the question, "As the data experts, what metrics or data could you collect to demonstrate the success of our capability?" This approach is the proverbial tail wagging the dog. Ideally, metrics and data should not be mined for a previously undefined factor such as "success." Although success stories may be found within the data, the better approach is to plan for metrics as data is being created and gathered by asking questions such as:

What is innovation capability trying to accomplish?

Why would that accomplishment improve effectiveness?

How do we assess capability efficacy through data collection?

Determining the what and why are not questions for the analyst, but rather more of a philosophical question to be answered by the innovation leader. Often, common justifications for innovation products have been tied to some assessment of cost savings. While quantifiable, cost savings assessments might not be the cure-all measure—especially if assessing an innovation product against a host of capabilities designed to be effective against a near-peer adversary.

"Efficient versus effective" is a timeless trade-off framework, and viewing it as a "versus" instead of an "and" relationship can be limiting. For example, we provide high-tech body armor not because it saves money on health care costs, not because it helps us prosecute a campaign more quickly, but because we value our Airmen. Cost efficiency discussions should also include product effectiveness and reliability.

Many of the metrics that AFWERX tracked in the first year were linked to growth—growth of the virtual collaboration tool participants, growth of event attendance, growth in the number of Spark cells, growth of the AFWERX organization itself, etc. For a young startup organization, growth, connectivity, and market penetration metrics are a good start.

Moving forward, our data analytics team at AFWERX is looking for ways to inform leadership about the efficacy of the various capabilities in addition to the growth. We want to avoid applying a tool, method, or another process without clearly defining upfront how it will be contributing to AFWERX's mission. With these clearer definitions, it will be easier to develop a plan to gather metrics that enable the assessment of process efficacy.

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It will still be challenging. As Marx stated in Capitalism: "So far no chemist has ever discovered exchange-value either in a pearl or a diamond." To be more than a "chemist," more than a mindset of "if there is no current measure of something it must not be important," we need to define what we value within an ordinarily nebulous process so that we can devise a plan to measure that value.

While it tells a story, the focus on the fielding of any particular technology might mask a leading value-add of AFWERX: AFWERX's value might simply be boiled down to a process-a process that opens the aperture of DOD acquisition to a new suite of cutting-edge technologies and capabilities. Care must be taken to adequately measure process-enabling value.

A CONTRACT FOR FLEXIBILITY TO ENABLE PIVOTING CONTRACTOR SUPPORT

A newly founded organization, particularly one focused on innovation, will adapt, grow, and mature over time. In contrast, government contracting agreements are fixed and initialized without prescience. While contracts can be modified, modification might not meet the rapid pace of change within a new, lean organization. It was important for both AFWERX and its contractors to understand this dichotomy so that each side could work together to flex towards a common meeting point—working within the rules to maximize partnership value towards the AFWERX mission.

For expediency, AFWERX-DC gained data analytic contracting support from Virginia Tech Applied Research Corporation (VT-ARC) through a Partnership Intermediary Agreement (PIA) contracting mechanism. This approach leveraged a pre-existing PIA between VT-ARC and the Air Force Office of Scientific Research. It was AFWERX's vision that VT-ARC maintains a collaborative

DC space, assist with technology scanning, and provide data analytics support. The language was written in the contractual agreement to reflect this intent.

From the contractor point-of-view, contracts have their advantages: they protect from "requirement creep"—new taskers popping up for which proper resourcing would not have been allocated. Contracts also have their disadvantages: they can make it difficult for the contractor to adapt to an evolving need. As AFWERX matured and evolved, so did its data needs. Yet the nature of the PIA (or any fixed contract for that matter) legally bound VT-ARC to the confines of contractual language, which could not possibly have foreseen all data analysis contingencies. A partnership agreement is not a service agreement. The partners are contractually bound (and therefore appropriately resourced) to meet the demands of the contract, but are limited in how flexible they can be in contract interpretation.

We were able to press on by keeping the "partnership" mentality. There were times (due to the overlapping nature of data analytic work) when VT-ARC had the skill sets to add value to AFWERX by lending a hand with capability development work. When possible, VT-ARC found ways to make this work. An example of adaptation was in website development. AFWERX needed a website. VT-ARC was positioned to help. We flexed within the bounds of the contract so that VT-ARC could provide website support while meeting the primary data analytic deliverable that was contractually demanded.

ENABLE CONTRACTOR SUPPORT BY KEEPING YOUR WORK ROLES CLEAR AND DELINEATED

While this particular situation is likely more AFWERX specific, we share it here as an anecdote to foster a good working relationship with contract support: While

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AFWERX grew, we began to seek out and leverage capabilities that SBIR companies provided. The advantage to AFWERX was clear: acquiring innovative capabilities to support the AFWERX mission while also gaining the advantage of reduced capability cost due to the cost-matching possibilities within the Open Topic SBIR structure.

Some of these SBIR capabilities intersected capabilities provided by current contractors (like those under the PIA), such as data analysis. The terms of intellectual property ownership greatly favor SBIR awardees. Muddying the tasking lines between contractors of various contract types can put contractors in precarious legal corners. As with all government projects, taking care to properly segregate workflows and data is beneficial to all parties involved. The need for workflow segregation became evident in the development of the AFWERX ecosystem, which leveraged SBIR support.

During the development of the AFWERX ecosystem, PIA contractors were invited to contribute their internal analytic capabilities to the greater ecosystem with the intent that the PIA contractors and SBIR companies would share capabilities to contribute to the greater AF user experience. Although all parties wanted to work towards bettering the common environment, much of the tasking would have moved the PIA contributions outside of the original contract intent. At the same time, because of differing contractual ownership rights (favoring SBIR companies over the government sponsor), the PIA partners had some trepidation about mixing their capabilities with those of SBIR companies. Ultimately, AFWERX recognized this situation and created clear delineation of efforts—enabling contractors to best contribute to AFWERX within their appropriate lanes.

AFWERX's customer management and marketing strategy was another case in which overlapping and ill-defined roles between contractors and Air Force

personnel hampered efficient execution. The path from an individual joining the AFWERX ecosystem to joining the AFWERX email distribution list involved three separate support contractor organizations and the AFWERX Air Force marketing team. Below we outlined a simple possible path to illustrate our point. It is worth noting that even this path can be further complicated by individuals who join the ecosystem at an event or meeting rather than through our web form:

> An individual submits a "join the ecosystem" form
>
> The data are added to a (currently Google) form and the individual receives an auto response email
>
> The data are added to a CRM
>
> The data from the CRM is pulled into a distribution group
>
> The AFWERX marketing team sends newsletters to distribution group

The simplest solution to this would be to assign clear ownership of a task to a single contractor, providing it with the mandate to execute the task and the flexibility to accomplish it with the tools and approaches it finds appropriate.

SUBJECT MATTER EXPERT (SME) SCOUTING

Must be paired with a well-planned and deliberate outreach effort to be effective

There were times when VT-ARC received requests to identify and provide lists of experts in a given field with a turnaround time of one or two days for an event happening within a week. Such requests proved to be of

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low-value impact for the event and also a drain on VT-ARC time and resources.

In contrast, the most effective scouting efforts had:

Clearly defined scopes

Several weeks or months of lead time before the event

A well structured, personalized outreach plan for the contacts

This more deliberate approach is the industry standard for event marketing expected in the private sector. It makes intuitive sense that this approach will outperform an unsolicited blast email marketing an event that is one week away. It is the more effective way to engage with supportive analytics.

"Sixty-three percent of all statistics are made up."

AFWERX-Vegas Innovation Hub

AFWERX Challenge

Allies:
NSIN, DIU,
SOFWERX

SBIR Open
Topics

Innovation
Hubs

Tech
Accelerators

> Never give in, never, never, never—in nothing, great or small, large or petty—never give in except to convictions of honor and good sense. Never yield to force; never yield to the apparently overwhelming might of the enemy.
>
> WINSTON CHURCHILL

THE PURPOSE OF AFWERX-VEGAS

Provide a gateway to USAF and the AFWERX mission for Airmen, industry, and academia

Create a space for collaboration and connect industry, academia, Airmen, and the investment community

Facilitate workshops, sprints, and prototyping initiatives that will create positive impact for our warfighters

Be a catalyst for culture change inside USAF to a more entrepreneurial mindset

Host the AFWERX Fusion Xperience: Innovation Showcase

A BRIEF HISTORY

AFWERX-Vegas, the second AFWERX innovation hub, was officially opened in January of 2018 by the Vice President of the United States Mike Pence, Secretary of the Air Force Heather Wilson, and the Chief of Staff of the Air Force General David Goldfein. It was formed under a Partnership Intermediary Agreement with the Doolittle Institute, and has since transitioned to a Commercial Solutions Opening contract with theDifference.

Las Vegas was chosen as the location for this hub due to having two prominent Air Force Bases (Nellis, home of the Warfare Center and Creech). Also due to the amount of visitors coming to Vegas (over 1 million per week), a major airport, lots of hotel rooms, and entertainment options. In addition, there are a number of very prominent events in Vegas that USAF wanted to leverage, for example, CES (Consumer Electronics Show), DEFCON (Hacking Event), Interdrone (Premier Drone Event), and AMAZON ReINVENT.

The Vegas Hub was designed for collaboration and inspiration. The decor, furniture, and room size were specifically designed to allow large and small teams to work together either by themselves or with expert facilitators. There is also a small prototyping lab space with 3D Printers, CNC Machines, Shopbots, Laser Cutters, and lots of hardware to make physical prototypes when needed.

KEY HIGHLIGHTS

10,000+ people have come through the hub to work on projects, learn about AFWERX and USAF focus areas, engage with Airmen in collaboration events, etc.

10+ physical prototypes have been developed at the Hub that are being tested and/or implemented by USAF.

100+ workshops have been facilitated to explore problem areas, outline opportunities, and develop roadmaps for implementation.

70+ different groups from within USAF and other DOD agencies have held gatherings at the hub to build connections.

LESSONS LEARNED & INSIGHTS SHARED

A small, diverse, and committed team can change the world with a big enough "Why."

The Vegas team is made up of a bunch of passionate, entrepreneurially minded people who want to make a difference. As our quote from Winston Churchill states, we never take no for an answer and always strive to find a solution to a problem no matter how many times we have to pivot. Our mission is simply to improve the lives of Airmen through improving efficiencies, effectiveness, and improving their quality of life; this is our why. We want to support the adoption of a culture of innovation and also a culture of wellbeing for our Airmen.

We have a flat organizational structure and we organize ourselves by projects which allows us to be agile to deliver on the mission no matter what USAF throws at us. We identified our strengths individually and largely self organize around the work required. Most of the team have been entrepreneurs themselves or at least worked in startups or held roles within innovative organizations, so we love driving the culture change that AFWERX is focused on.

In over two years of operations, we realized if we connect to the purpose and meaning of our mission and focus

on our WHY, we have the motivation to overcome the challenges and obstacles thrown our way.

NEVER BE AFRAID TO STOP DOING AN EXPERIMENT IF IT IS NOT WORKING

As a team, the Vegas Hub thrives on trying new things, launching initiatives, getting involved in projects, etc. While doing all this we have to continually check in to see if what we are trying is working or not, sometimes we have had to revert to an old process because the new way was not as efficient or even stop doing a major activity that wasn't delivering the results we wanted.

The lesson learned from our team is to create some hypotheses before launching an initiative and gather data to allow rapid decision and re-decision making.

As an example, we were very excited in 2018 to launch our First Friday initiative, which was to be a hosted panel/discussion on a topic important to USAF where we would have guest speakers/panelists, a live audience at the Hub, and an online audience. We loved putting this on, even though it was hard to find speakers at times. We didn't gain enough traction online for the amount of effort we were putting into these monthly gatherings. So we decided to stop them. We gathered the learnings and reasons why we stopped so that maybe the decision could be revisited should the conditions change.

Another example was the monthly showcases we offered to industry. Anyone could come in and present a 'solution' to us that we would try and find a problem for inside USAF. Or we would connect the innovator with a Subject Matter Expert to discuss their idea. However, this turned out to be a service and a promise to industry that we could not fulfill as it was too time consuming to connect solutions to problems or SMEs inside USAF. So we stopped hosting these and instead threw our energy

into support the SBIR initiatives of the AFWERX team and also AFWERX Challenge as we saw that as a more scalable way to connect industry to USAF to create positive impact for the warfighter.

WORKSHOPS

Are a very powerful way to uncover the true problems that need to be solved, identify outcomes, and also some solution pathways

It is challenging enough to get a small team to agree on something, now imagine getting an entire room full of 50–200 people to come together on an important topic. It is an arduous, and at times, seemingly impossible task that requires a well-developed understanding of psychology, anthropology, innovation, and communication among humans.

If the Air Force is to be innovative and build a culture to support this innovation, it has no choice but to work together. Workshops are one way to make that happen. There are many different types of workshops but all fulfill one goal: to explore options and reach a decision (or decisions) and build consensus around them using a collection of creativity, group dynamics, design thinking, human centered design, and other innovation processes and techniques.

The right workshop led by an experienced facilitator and held with participation from key stakeholders and Subject Matter Experts (SMEs) can greatly expedite the development of any project. They can boost morale, build a positive culture, get people excited, and clarify a path forward.

Our workshops range in size from three people to 200 people and we have created different structures for the workshops dependent upon the goal. Workshop types include: discovery, scoping, problem definition, solution

exploration, project roadmapping, challenge definition preparation for AFWERX Challenges, team effectiveness, pitch development, and others.

WORKSHOP AND SPRINT DESIGN

Are critical to a team's success, shortcutting these steps is perilous

Both with workshops and sprints, we have found that the best chance of success occurs when project leaders engage in design, planning, and collaboration with key stakeholders in advance of our gatherings, and depending upon specific needs, sometimes months in advance.

Our design-to-protoype process begins with an inquiry of the requesting intrapreneur:

What are they hoping to achieve?

Is there a problem you are trying to solve, or an opportunity to achieve?

What is the timeframe?

How many people will be participating and who will they be?

Do you need support to find appropriate SMEs to support the workshop?

What resources are required?

What risks or roadblocks are seen as possible impediments?

The answers to this inquiry provide a starting point from which to begin discovery (the process of learning more about the reason for the workshop and the factors that influence it). They enable dates to be locked into everyone's calendars, and they start the timer counting down the days until the kickoff of Day 1 of the event.

The facilitator will use this time to work closely with the requestor's team to establish objectives for the workshop, as well as to identify, contact, and ultimately extend invitations to key stakeholders and SMEs. Information gathered will guide and inform the facilitator in the design and eventual implementation of the workshop.

This preliminary planning phase is time intensive but crucial to the overall success of the workshop. Reductions in preparation time can reduce the success of the workshop. Of course, we understand that sometimes there is no time to do all of this properly and we have to 'wing it' with the stakeholders. We do that when needed, but it is important not to have this become the norm.

NEUTRAL AND EXPERIENCED FACILITATORS ARE ESSENTIAL TO WORKSHOP AND SPRINT SUCCESS

Workshop and sprint participants are often surprised to learn that AFWERX-Vegas facilitators or our "3rd Party Facilitators" are not also typically SMEs in the subject matter of the workshop. Often, these facilitators don't even understand industry specific acronyms. This can cause anxiety prior to the actual workshop, but once it commences, they begin to understand that deep, technology specific knowledge is an unnecessary requirement of a good facilitator. Instead, a good facilitator must understand the process of working with groups of humans to achieve a common goal, maintaining energy, managing time effectively, and staying on mission.

We prefer a facilitator not to be an SME for two main reasons: the first is that the participants bring the expertise, so what a facilitator may lack is generally compensated for by the attending SMEs. The second reason is that when one acquires deep subject matter expertise, there are concurrently numerous biases. It is

a natural part of the learning process but is not typically recognized by the individual. Bias is arguably the greatest roadblock to innovation. Our workshops are specifically designed to counter and hopefully mitigate bias. For a facilitator to be effective in his/her role, they must remain unbiased.

The facilitator's deep expertise exists in knowledge of the human change process and various innovation process principles. When that knowledge combines with an absence or de minimus of bias, the combination creates a synergy that makes AFWERX-Vegas workshops so effective.

THE PARTICIPATION OF THE RIGHT STAKEHOLDERS AND SMES MAKES ALL THE DIFFERENCE FOR WORKSHOPS AND SPRINTS

During the inquiry and discovery phases, effort will be dedicated to establishing a list of stakeholders to invite to the workshop. A stakeholder can offer value in a variety of ways. They could be influencers, decision makers, operators, representatives of the group being affected by the problem, SMEs, etc.

The "right" SMEs are critical to the success of a workshop or sprint. A great deal of time is dedicated to locating them, conducting interviews, providing them with information, establishing expectations, and getting them to commit to attend. They must possess the right qualities of expertise, mental agility, decent communication skills, creativity, problem solving, and the ability to simplify the complex (a good facilitator can also help with this). Most importantly, they must be able to work as part of a team. Finding SMEs is challenging given all of these requirements and the fact that sprints can be a pressure cooker event with limited resources.

SMEs can also represent a USAF functional area such as: Human Factors, Contracts and Sub-Contracting, Legal, Policy, SPO/Program Office, Engineering Lead, Test & Eval, AF Production, Sustainment, User/target audience, IT Infrastructure/Systems Management, Inventory Management & Tracking, Supply/suppliers, Distribution, Customer Awareness/Marketing, Acquisitions, Aircrew Flight Equipment (AFE), Logistics, Maintainers, etc. The skill is to pick the appropriate representation for each workshop. We have found that when dealing with USAF project teams, a common mistake is to think that functional areas do not need to participate or that they can be brought in later in the process. A "lob the grenade over the fence" approach has traditionally been the modus operandi. However, by deferring engagement with key end-users, warfighters, and functional organizations during the initial, sometimes sloppy-looking innovation phases, a great opportunity is lost. Key stakeholders miss out on providing engagement, and consensus and support for a project become unnecessarily reduced. The more awareness and empathy they hold for a problem, the more inclined they are to work towards a resolution.

Great care should be invested into the selection of the right participants at a workshop and it is never too early to invite them to get involved. SMEs can be extremely beneficial and they can also be harmful. Fortunately, with a bit of understanding and pre-planning, this misalignment of interests can be readily addressed. Some things that we have learned in relation to SMEs at a workshop:

> Due to their deep level of expertise, SMEs can bring with them many biases. In addition, they most likely represent a particular company or organization that is attempting to sell a product or service. The statement "When you are a hammer, everything looks like a nail" has never been more accurate than when a large potential military customer is describing a problem that could potentially be solved using one of the SME's

offerings. So we explain to the SMEs the role we want them to play and give feedback if we see a SME being too 'salesy' or not listening to other perspectives.

SMEs can exert great influence upon a group while working through the problem definition phase. To avoid this, simply bring them in after this phase is complete. Also, ensure that there are multiple SMEs present, all with contrary views. The goal is to provide the Air Force team with multiple options and perspectives.

SMEs can be sourced from many places, but LinkedIn and personal recommendations from other SMEs have proven to be the most productive. Both rely upon a strong network to be successful and a well thought out strategy for how to approach potential SMEs without the benefit of a pre-existing relationship.

When dealing with SMEs, avoid ambiguity and "over selling" a project and instead focus on communicating the project's potential impact and service to our country.

COMMIT TO UNDERSTANDING AND SOLVING THE PROBLEM, NOT PUSHING A SOLUTION

Warfighters are trained to identify the enemy and eliminate the threat. It is what makes the US Air Force the premier air power in the world.

This behavior transcends the battlefield to influence the lens in which the Airman sees the world and innovation is no exception. In fact, nearly every Airman that attends an AFWERX-Vegas workshop is laser focused on a particular solution. Having a solution in mind is a bias that can significantly impede a stakeholder's ability to see the problem objectively and evaluate multiple solutions.

Not surprising, then, is how some Airmen see a problem, come up with a solution, and then try to implement the

solution. In most cases, the problem is not completely or correctly identified and as a result, the solution solves the wrong problem. Resources are squandered and the original problem remains.

It is time to change our mindsets from "We want to hear your ideas" to "We want your commitment to solving a problem." Airmen should be encouraged to identify problems and then work through a proven process that begins with accurately identifying the problem while building consensus among key stakeholders. Only then should solutions be considered. If a solution must be provided, then Airmen should be required to identify three solutions, again, to avoid any bias and attachment to a single idea.

As a guide here are some questions that we like to see if we can answer to know that we truly understand a problem, we would then call it a well formed problem:

> What is the problem you have noticed?

> Why is this an important problem to solve?

> When did you notice this problem?

> How long has this been a problem?

> Who is impacted by this problem?

> What are the contributing factors to this problem?

> What is the cost of allowing this problem to exist?

> When would you like to have this problem resolved?

At the same, time we like people to focus on the outcome they want to see if they were to solve this problem, we would then call this a well-formed outcome:

> Why is this outcome important to achieve?

> What is the outcome you would like?

> Is this outcome worthy of the effort to achieve it?

> What resources would you require to achieve this outcome?

> How would you know you have achieved this?

> Who would be impacted by this outcome?

> When do you want to achieve this outcome?

We like to say that the problem and the outcome are two sides of the same coin. One side describing the problem at the moment and the other the outcome possible. Neither though define the solution, only the problem and the outcome, the solution options can then be explored and measured against the problem elimination and the outcome attainment.

TRUST THE PROCESS

The purpose of innovation is to open up new opportunities while mitigating the risk inherent in such an exploration. Too often, it is treated like a game of chance with no consideration given to the risk factors or the reckless waste of resources.

This is where a time tested and battle proven process becomes essential to the Air Force's success in growing a truly innovative culture. It is a process that starts with defining the problem, defining the outcome, exploring all possible solutions (rather than just one), and testing these solutions (experimentation) in ways that do not expose this nation's defensive posture to catastrophic risk.

Those who do not understand the importance of such a process apply pressure in the hopes of bypassing it, or shortening it to expedite development. This is a myopic view that impacts the ability to successfully deploy solutions while also depriving Airmen of the chance to learn the process and take it back to their units and become force multipliers.

CONTRACTING AND LEGAL SUPPORT CAN BE A GAME CHANGER

We have found through experience that the presence of contracting and legal can be a game changer for both workshops and sprints. Their buy-in is essential to help smooth bumps along the way in the future and also to get their words of wisdom at the start of the project to set things up for success.

Sprints are a great way to achieve quick wins. You should be able to go from an idea to prototype in four days. This is the power of rapid innovation.

Certain projects benefit greatly from the rapid prototyping of a minimal viable project (MVP) or refinement of an existing prototype.

Sprints compress the process of discovery, problem definition, solution exploration, solution roadmapping, and prototyping into a whirlwind four-day session. The days are long and the experience is both exhilarating and draining for participants. Day 1 is dedicated to discovery and problem definition. Day 2 is spent on solution exploration and roadmapping, and Days 3 and 4 are used for prototyping. Based upon feedback from participants, future sprints will be extended to five days to allow one additional day for prototyping, which also tends to be the industry norm.

PHYSICAL PROTOTYPE SPRINT CASE STUDY

KC-135 Boom Operator Instructor Platform

Background: Since 1956, KC-135s have fulfilled a vital role to the Air Force as aerial refuellers for other aircraft. The process of transferring fuel is accomplished by extending a "Boom" from the rear of the KC-135, securing the Boom to the aircraft requiring fuel (while in flight!), performing the fuel transfer, and then retracting the Boom back to the KC-135.

This delicate and challenging process is conducted by a "Boom Operator" who sits in a specially designed chair and manipulates several controls while observing the fuel transfer through a small window. Mistakes can result in millions of dollars in damage. In some cases, loss of lives, aircraft, and equipment, so it's vital that it's done right.

Boom Operators are trained by highly experienced experts in the field with many thousands of refueling hours under their belts. These individuals are referred to as "Boom Operator Instructors." As imagined, cultivation of these instructors requires a considerable investment of time and money. A lack of instructors directly impacts readiness throughout the entire fleet.

Problem: The designers of the KC-135 did not foresee the need for more than one individual to occupy the Boom Bay at a time, let alone a Boom Operator Instructor observing and guiding student Boom Operators. This resulted in an environment ill suited for the Boom Operator Instructors. While the Boom Operators are provided a chair to support their body during a flight, Boom Operator Instructors are forced to remain in the prone position upon a curved shelf for hours with no support for their upper chest, neck, head, or back. Simultaneously, they are expected to retain control of a handle exerting 25 lbs of continuous pressure. Often, their bodies make contact with the skin of the aircraft, which can become cold enough to freeze a bottle of water during a typical flight.

Intrapreneur: CMSgt "Bach" Bachleda (promoted since we first met him as MSgt Bachleda) is a highly seasoned Boom Operator Instructor who had experienced these issues firsthand. For years he taught in these conditions and watched as many of his fellow instructors suffered with chronic back, neck, and shoulder pain. He also

calculated the cost both financially and in terms of readiness and quickly realized that this represented a significant problem.

In January 2013, Bach decided to try to solve the problem and with his own money and time, constructing new prone position instructor prototypes which he fitted to the aircraft. He filled out the required 1067 forms and submitted his prototypes to the Program Management Office (PMO). As the years dragged on with little forward progress, he grew more and more frustrated. This frustration culminated when he was informed that the PMO had lost his prototypes.

In the fall of 2017, when AFWERX introduced its inaugural 2018 Spark Tank competition, Bach submitted his idea for the Boom Operator Instructor Platform. Bach's solution was selected as the winner of the competition. He was sent to AFWERX-Vegas for guidance in developing a test and evaluation ready prototype to be turned over to the Air Force.

Sprint at AFWERX-Vegas: AFWERX-Vegas worked with Bach to design a rapid prototyping sprint that would be conducted at the Vegas Hub in the span of four days. Subject matter experts, functional representatives, and fabricators were carefully selected and contracted to participate.

An early concern regarded the ease with which someone with a solution to a problem can become fixated on their solution as the BEST and ONLY solution; AFWERX-Vegas goes to great lengths during workshop/sprint planning to specifically minimize this bias. Bach could have easily fallen into this trap! However, numerous phone calls prior to the Sprint discussing mental preparation and expectation management combined with Bach's desire to simply solve the problem and get the best solution out to his fellow instructors (whether it was his or someone else's) ensured this was not an issue.

The Sprint kicked off July 24, 2018, with introductions and some creative exercises to help everyone feel more comfortable. This was followed by an entire morning of detailed "discovery." Discovery is performed to gain insight into the "pain point" felt by those affected by the problem. Efforts were made to gain access to the actual Boom Bay of a KC-135, but multiple attempts resulted in learning that no such aircraft were available within geographic proximity.

Instead, participants reviewed slides and asked a multitude of questions about what they were seeing to gain a thorough understanding of the problem. The slides had been carefully prepared by Bach and included very clear pictures and measurements of the Boom Bay. He answered all questions very patiently and in a manner that could be understood by those outside of the refueling community. Any lack of comprehension was quickly clarified through further questions asked by the facilitator. The entire morning was dedicated to this discovery session. This segment consumed a sizable block of time for an event in which every minute was fully utilized, but its value was priceless.

Concurrently, onsite fabricators received their first task of building a Boom Bay mockup according to the schematics and input provided by Bach. This simple but realistic wooden model enabled the participants to experiment on a lifelike scale model throughout the entire Sprint and proved extremely helpful. (It was completed and available in the late morning of the second day.)

The remainder of the first day focused on identifying the problem and aligning all participants around that problem. The problem was defined as: "The Instructor Boom Operator (IBO) must operate in an antiquated environment lacking adequate stability, support, and field of vision resulting in short and long term negative medical and mission impacts."

While some would question the wisdom of using valuable time to define a problem that has already been stated, this is standard practice for AFWERX-Vegas given that problems are often misidentified or not fully developed. In addition, if key stakeholders fail to agree that the problem stated reflects the actual problem, their investment into the solution will be minimal and will greatly diminish the likelihood of a successful outcome. A specific example may help illustrate this important point...

In order to better communicate the problem, a table was cleared off and participants were invited to take turns laying upon the table in a similar manner as Boom Operator Instructors were forced to lay upon the shelves in the Boom Bay. Once in the prone position, a 25 lb backpack was handed to the individual to represent the pull of the Boom control. The Program Management Office Lead Engineer took his turn and laid upon the table and was handed the backpack. He was only in the position for a few seconds before he began to experience severe discomfort and had to get up. When Bach explained to him that Boom Operator Instructors were required to be in that position for hours, it was obvious to all that the engineer had innately grasped the gravity of the situation; he was fully bought in!

On the second day, participants explored possible solutions. Again, they were not confined to Bach's proposed solution and were in fact challenged to come up with many other creative ideas. Pros and cons of each solution were debated and ultimately narrowed down to a solution similar to Bach's original proposal. By the end of the day, the entire team had identified constraints, agreed upon a solution, and formulated plans to build multiple variants and perform basic testing.

The third and fourth days of the Sprint were spent in small teams building prototypes, testing hypotheses, and tapping into the expertise of functional experts in areas of Human Performance, maintenance, sustainability, and others. Time and time again, the value of their participation was reinforced as they made suggestions in the design of the solution that minimized or completely eliminated future costs and/or additional development time. For example, if a portion of the panel would have been extended by a few inches, it would have been construed as a step and required months of additional testing.

Over the course of the four-day workshop, a realistic mockup was built from plans provided by Bach. An aluminum mountable headrest prototype was machined, two versions of the newly designed panel were fabricated, the existing foam pad currently in use was cut, a newly designed pad and hip pillow were developed, and CAD plans were drafted. To avoid loss or damage, all deliverables were loaded into a rental truck and driven back to Tinker Air Force Base in Oklahoma by the Program Manager and Lead Engineer.

Production costs were also calculated for the panel, the mattress, and the hip pillow by a SME from the 53rd Test Support Squadron. It was determined that due to the simplicity in the design, the panel could be produced organically by almost any Air Force machine shop for a mere $63.50. This was quite a savings from the much more complex design proposed by a prime contractor at $5,500 per panel. The PMO hadn't been able to get quotes on the mattress or hip pillow but their estimates placed its cost at a similar or higher price range.

As planned, the prototype developed in the Sprint was tested and evaluated by the Air Force and in late 2018, the PMO submitted a request for AFWERX-Vegas to build 26 more mattresses, 26 more hip pillows, and 21 more panels in accordance with revised plans based on the results of testing. In February 2019, the plans were received, and estimates for the work were collected. Funding transfer issues caused a delay, but in July 2019, a single unit was ready for inspection. The Program Management Office sent multiple representatives to

inspect it. They recommended small changes and approved the design and workmanship. In October 2019, the remaining units were built and shipped to three locations identified to conduct testing.

Outcome: As of this writing, the final testing is underway and AFWERX eagerly awaits the results. Expected fielding is anticipated to occur sometime within the second quarter of 2020. Implementation of the platform across 414 tankers is projected to save the USAF hundreds of millions of dollars a year, amounting to billions over the remaining lifetime of the KC-135.

AIRMEN WANT (AND DESERVE) TO PROTECT THEIR INTELLECTUAL PROPERTY RIGHTS FOR SOLUTIONS THEY DEVELOP

Historically, the unspoken rule of the Air Force was that it owned Airmen 24 hours a day, including anything they produced. If a Maintainer developed a fishing lure over the weekend, it was instantly the property of the Air Force. Airmen did not expect to receive any compensation for such an endeavor. Today's Air Force has adopted a very different mindset; it encourages Airmen to explore, experiment, and innovate. The infrastructure required to support this effort is also evolving.

Airmen who never had a need to protect their intellectual property (IP) rights are now finding themselves in a position where they are, in cooperation with Air Force Legal and the AFRL Technology Transfer Office, filing patent applications. Our sprint for the Joint Chemical Agent Detector (JCAD) Alternative Power Source provided a test case. The Intrapreneur was very concerned about his IP rights, and rightly so. As a result, many hours were spent researching how to incorporate best IP practices into our sprint

process, including Non-Disclosure Agreements (NDAs), controlled and limited access to the lab, review of any products or summaries by Air Force Legal prior to release, and limited exposure of anything built during the sprint. In the end, these steps were all quite manageable as part of our overall process and have become a standard practice for IP sensitive sprints.

WHEN PREPARING FOR A PHYSICAL PROTOTYPE SPRINT, REMEMBER THAT PARTS AND MATERIALS CAN TAKE A REALLY, REALLY, REALLY, REALLY LONG TIME TO LOCATE AND ORDER

The building of physical prototypes requires parts and materials. The challenge is that it is not always easy to predict what is needed prior to the event because the problem has not yet been fully articulated and the possible solutions have not been solidified. This is where discovery prior to the sprint becomes so essential. At the very least, discovery will enable the facilitator to understand which SMEs should attend, and ideally, a vast majority of the parts and materials as well. However, regardless of the quality of the discovery, additional parts and materials will always be required.

A strong support team dedicated to locating parts, ordering the parts, and other non-facility tasks will be required in order to free up a facilitator to lead the sessions. Otherwise, the facilitator is either absent for periods of time or engaged in long phone calls. For example, the many parts and materials required for the JCAD sprint presented a significant challenge and had a negative impact on the facilitator's ability to be physically present for certain periods of time. This occurred despite having another individual to provide support, and caused the sprint team to not be fully utilized during the facilitator's absence.

BE WARY OF THE PHYSICAL PROTOTYPE VANITY TOOLS; BUILD RELATIONSHIPS INSTEAD

Setting up a few 3D printers does not in itself create a suitable space for rapid prototyping sprints.

The essential elements of a successful sprint are: an experienced facilitator, suitable equipment, operators to run the equipment, access to the right SMEs, and dedicated use of external fabrication shops if needed.

AFWERX-Vegas has a Protoyping lab with 3D printers, laser cutters, CNC machines, woodworking tools, hand tools, and other miscellaneous equipment. In addition, fabrication assets have been developed within the local community through partnerships with fabricators which can be contracted to provide additional services, and a partnership with University of Nevada, Las Vegas (UNLV) grants access to multiple machine shops on campus, just 10 minutes away from the Hub.

HOSTING THE AFWERX FUSION INNOVATION SHOWCASE

The AFWERX Fusion Xperience (a.k.a. Fusion) is an annual event hosted by AFWERX-Vegas on behalf of AFWERX and ultimately the U.S. Air Force. Fusion 2018 had 600 attendees, Fusion 2019 had 1,200 attendees, and at the time of writing we are preparing for 3,000+ attendees at a larger venue to continue the exponential growth of this event.

What makes this event special is that we select one of our AFWERX Challenge topics and showcase the best solutions as the central tenet of the event. In 2019, we featured the Multi-Domain Operations (MDO) Challenge. From the 317 solutions offered from all over the allied world and from academia, small business, large

business, and defense contractors, we selected the top 100 teams and invited them to the MDO Showcase.

In addition to the showcase portion of the event we select keynote speakers and host panels, demonstrations, workshops, and other interesting experiences to provide value to the attendees over and above the chosen challenge topic. We ensure the event is well designed to show that USAF means business and is trying to do things differently in support of the AFWERX mission.

Fusion is an excellent opportunity for Airmen, senior leaders, academia, private sector, and defense contractors to meet, share ideas, and create ideas for future collaborations. It's a chance to get many of the selected companies on contract during their pitches either on the showcase floor or in private presentations to USAF potential customers.

CLOSING COMMENT

Facilitators are needed throughout the Air Force to support and drive change; consider shadowing or apprenticing with us for an event or two

We believe that to be effective in driving innovation throughout the Air Force, a large number of facilitators will need to be trained in Lean Startup, Human Centered Design, and Design Thinking methodologies. Then deployed to units to which they are external (to avoid developing a bias).

But it is not enough just to finish a course on design thinking and then think you can facilitate a 50 person workshop or work with a challenging group of opinionated stakeholders in a smaller workshop. We need to develop the facilitators and provide them with shadowing opportunities to get involved in running similar workshops. At AFWERX-Vegas we offer that

opportunity to interested Airmen and members of other services. At the time of writing, we have representatives from AFRL, Navy, and the National Guard shadowing our team in Vegas so they can see our methods, ask questions, and hopefully leave better able to support their team when they return.

"Never yield to force; never yield to the apparently overwhelming might of the enemy."

#FEARLESSNESS #MINDSET #INNOVATION

AFWERX-Austin Innovation Hub

AFWERX Challenge

Allies: NSIN, DIU, SOFWERX

SBIR Open Topics

Innovation Hubs

Tech Accelerators

> "People don't live in Austin to work; they work there to live."

THE PURPOSE OF AFWERX-AUSTIN

AFWERX-Austin provides the culture shock necessary to break down the calcified perceptions about the Air Force. Offering a way for Airmen, innovators, and researchers to experience an entrepreneurial culture is a first step to building a strong network of allies and advocates who will continue to unleash the Air Force's innovative spirit.

A BRIEF HISTORY

AFWERX-Austin was "created" in 2018 as the third hub location for AFWERX operations. It is located within the innovation collider space of Austin's "Capital Factory." It is run by Air Force Reservists and is unique in that respect.

KEY HIGHLIGHTS

AFWERX-Austin has hosted numerous design-thinking workshops and challenges, while also strongly supporting the Small Business Innovation Research (SBIR) Open Topic mission and the Spark capability.

LESSONS LEARNED & INSIGHTS SHARED

Humble beginnings ("no operating budget") may hide rich, future outcomes

As with most success stories, the mythical genesis of the founders grows over time. However, as with most beginnings, the start is simple and usually mundane. While the same circle of thought leaders gathered together to sketch out what AFWERX-Vegas could be, a parallel effort was growing out of Air Education & Training Command (AETC) for some kind of new innovation project team.

Led by Lt Gen Kwast, the effort formed around starting a technology innovation cell that would support his initiative called Pilot Training Next. Lt Gen Kwast and his team knew that they wanted to place the cell "outside of the fence" of a typical military base, so they scouted locations and landed upon Austin. With the Texas Military Division headquartered in Austin, as well as the Defense Innovation Unit (DIU) presence in Austin, there were favorable conditions for military innovation. Lt Gen Kwast's initiative sparked an idea among the AFWERX circle of thought leaders: "What would a strategic partnership look like between AFWERX and a MAJCOM? Let's find out!"

Out of these conversations was born AFWERX-Austin and the AETC Technology Integration Detachment (ATID). In just over a year, the team grew from one person and one project to ten people and twenty projects. During that time we partnered to develop better tech for Pilot Training Next (PTN), Recruiting Next, and Maintenance Next. For example, in December of 2018, we hosted a competition to help improve the PTN simulator class with data collection, and winners from the December competition contributed new capabilities such as biosensors, data architecture, and integration.

One of the interesting and most assuredly not mythical parts of AFWERX-Austin's story is that it was a "moment of opportunity" decision—and its initial budget reflected that decision. AFX-A was largely told, "you are in a great location. Show us what you can do. We should have budget money in 2019." This was March of 2018, and we hosted the SECAF in July 2019 to officially open AFWERX-Austin.

BE PREPARED AND EXCITED TO JOURNEY OUTSIDE OF "PLAN, DO, CHECK, ACT"

AFWERX-Austin is known for exactly what it is titled—a hub. When servicemembers outside of the entrepreneur community think of a space to convene, they typically think of "commander's calls" in dimly lit movie theaters or yellow-tinged enlisted and officer clubs. Unsurprisingly, our downtown Austin location is nothing short of a culture shock. The atmosphere is what we dream of when we think about what it would be like to work in the heart of Silicon Valley–kombucha and hummus available for consumption and an endless stream of free events for groups focused on coding or marketing your product.

But food and events are not what makes the tech and entrepreneurial hub amazing. The magic stems from the simple idea of creating an environment which breaks

down barriers and facilitates connections. Every day you work at AFWERX-Austin, you pass by a handful of other changemakers in the Department of Defense innovation space and countless other nodes in the network of passionate problem solvers. It is only a matter of time before you come to know each one of them and become a valuable part of a unique web of innovators.

That kind of collective connectivity is rare on most military installations. Sure, you may occasionally pass by people you know, but where is the incentive to have a brief conversation with them? Who wants to chat with someone who's bummed about what they've been tasked to do that day while standing in a dimly lit hallway only to leave you annoyed about the state of your career field or the Air Force as a whole?

Now imagine that you are an Air Force member passing by someone from the Army who is interested in artificial intelligence and your subsequent conversation reveals that there is a company that was just awarded a contract to solve the exact same A.I. issue. Just like that, you experienced information transfer more effectively than any scattershot email could have produced. Additionally, you can continue the discussion in one of the dozens of chairs set up across the building...as if the building's creators knew that you would someday need a space to have an impromptu meeting with someone.

This unscripted, impromptu, "Wait! That was not in the plan…" environment goes against much of the traditional command and control approach of the military. It seems that every new visitor that stops by AFX-A initially struggles to wrap their head around what is going on and how they fit into all this. This struggle, often not spoken, is the first step to transforming a visitor's worldview and their understanding about what it means to be part of an innovation ecosystem.

You can do a lot to set the innovation odds in your favor. However, no one has the perfect vision to say "... and as a result, we will achieve X prototypes in the next nine months, with Y of them becoming full programs of record." There is some amount of "Plan, Do, Check, Act," but there is also a large amount of "Get started down the trail and pivot to a better path as appropriate opportunities arise."

Sure, there are a few visionaries inside the Air Force who understand the possibilities of what could be and go on to make strides without entrenching themselves in a place like AFWERX-Austin. At the same time, there is an old maxim for most people—"You can't be what you can't see." If an Airman First Class can't see the power of a personal network, why would they take the time to build one? If a Senior Master Sergeant isn't familiar with ways by which she can incentivize her troops to explore their passions at work, how can she truly empower her Airmen?

It is not as simple as shouting "innovate!" and then watching it happen. For the same reasons people need to travel to see other countries and cultures to develop and expand their worldview (and associated thinking styles), so too do Airmen need to have their understanding of the possible expanded and developed into something truly extraordinary.

FOOD FOR THOUGHT

Leverage multiple innovation approaches by connecting them

AFWERX-Austin is like that hot new restaurant downtown you keep hearing about and just HAVE to reserve for your birthday party. But you're not the only one. Everyone wants in, but few have actually been there to understand the landscape. Requests to visit fly in left and right and it seems every medium-sized Air Force organization wants to hold their next gathering or workshop there. Little do they know, this restaurant that serves the experience is run by less than 10 people—only three of which actually work at the location full-time. For a capability that thrives off of being open-to-the public, managing the influx of guests—namely those who just want to "pop by real quick on my way to San Antonio"—can often feel like a never-ending tidal wave upon which we must swim. Yet we press on...inspired to help!

Despite the consistent flow of onesie-twosie visitors, AFWERX-Austin has established its role as a lead facilitator in the quest to connect Airmen with the outside world—and the other way around. For example, consider the first-ever Spark Collider. The collider followed a round of revolutionary Small Business Innovation Research (SBIR) "Open Topics" in 2018. The Open Topic approach busted the floodgates open for warfighters and the entrepreneurs who will, always and forever, be in search of a warfighting end-user whose mission will be enriched by the entrepreneur's product or service (please see the SBIR / AF Ventures chapter). The Collider event then helped match the entrepreneurs to the warfighter units' needs.

We remember when a Technical Sergeant and Aerospace Ground Equipment specialist out of Dyess Air Force Base, Texas, pitched her problem at the Collider gathering. Her career field tracked all equipment via paper forms, and that seems slowed and antiquated. Immediately following her presentation, newly awarded SBIR companies lined up to offer to tackle her unit's issue. Meanwhile, an Airman 1st Class security forces troop and Spark Cell member based out of Joint Base Elmendorf-Richardson, Alaska, was attending breakout sessions on how to work through the process of working with one of these companies.

While it may look like it, it is not purely happenstance for Airmen, businesses, investors, or whoever else to become a valuable node in the AFWERX network. The

building of a community takes deliberate planning based upon two of the most inherent human needs we all have—connection and purpose.

Meeting one person working on a cool invention or attending a single event that boasts about the benefits of innovation is not enough. Indeed, it might be deceptive because it does not show all of the long hours that occurred before the technologies were ready for demonstration. People need repeated contact with a new concept or idea before they can begin to internalize its capabilities. By embedding AFWERX within a vibrant center of gravity for innovation and simultaneously inviting those who may have, at times, felt treated as pawns who carry out someone else's destiny, the Austin hub is becoming a symbol of inclusivity and empowerment for Airmen of all ranks.

THE CHALLENGE WITH CREATING SO MUCH INTEREST? YOU NEED TO HAVE THE RESOURCES TO SCALE YOUR EFFORTS

Community outreach is easy to accomplish in a dynamic startup city like Austin, Texas. There is no shortage of invitations to attend networking events, conferences, or speaking engagements. The team usually attends three events a week outside of office hours. The defense innovation movement is alive and well, and the issue is not the lack of exposure or interesting the right caliber of talent; it's the proper care and feeding of the leads we attract during such events.

The outreach messaging we promote is AFWERX has the ability to connect Airmen intrapreneurs with researchers, thought-leaders, cutting edge companies, and other experts by using accelerators, public challenge events, and targeted outreach. We speak about how the Air Force is looking to put emerging technology into the

hands of our warfighters rapidly and we talk proudly of our SBIR metrics over the past year. All this talk excites people, understandably so, who then have a million questions and request the all too quick "30 minutes" to explain their technology. One-on-one meetings are not sustainable for any large scale operation. At AFWERX, we transitioned from having one-on-one meetings to doing a weekly call with groups of companies and having an FAQ to answer the basic questions that come in repeatedly. Then we created an easy pathway for companies to get on contract and help us solve problems

Part of the appeal of having a ground floor storefront at Capital Factory is the accessibility the community has to the AFWERX team. Josh Baer, CEO of the Capital Factory, stated it well when he said, "Austin is the only place in the world where an entrepreneur can walk in off the street and engage with defense leaders to develop ideas and solutions to push the military forward." However, each "cold call" office visit takes team members from accomplishing their core tasks. Therefore, it is becoming more frequent for people to work in the back office to avoid such interactions.

Public interest and engagement is strong, but the number of follow-up requests that come from our outreach efforts is increasing at an exponential rate. The number of inquiries generated is quickly becoming overwhelming for our small team to manage effectively, and proper communication is increasingly more difficult. The defense innovation public storefronts are revolutionizing our Nation's defense industrial base. This type of disruption has many advantages, but also brings along with it much curiosity, scrutiny, and queries for more information.

THINK LIKE A CEO—BE FRUGAL

Accomplish more with less. Constraints breed resourcefulness, self-sufficiency, and invention. There are no extra points for growing headcount or budget size. When I first started as AFWERX-Austin Deputy Director, I was given my first project to plan for the grand opening of the AFWERX-Austin Hub—to host the Secretary of the Air Force. I responded:

GREAT, HOW MUCH BUDGET DO I HAVE AND WHO DO I HAVE TO HELP ME?

Lt Col Dave Harden, AFWERX's COO, smiled and replied that I would have no budget and no support, and that I need to start thinking like a CEO.

Naturally I laughed, but I soon faced the harsh truth of the environment. I was forced to be creative and resourceful. My only path to success was to leverage relationships but I had yet to have relationships established. First, I reached out to who was closest to my proximity. I reached out to the Capital Factory, where our AFWERX-Austin office resides, and began to sell a vision for our partnership. I discussed with them how signage, marketing, and allowing us to use some of the Capital Factory space free of charge was a benefit to Capital Factory and the ecosystem. They agreed to help! I appreciated their vision and partnership.

Also, I knew that AFWERX-Vegas had opened recently so I wondered if there were any open contracts that I could leverage. I reached out to the designers of signage on Vegas's contract to see if I could leverage their recent work. They were happy to extend that work to cover a design for AFWERX-Austin at no extra cost so that they could market their work outside their local area. Ultimately, I pulled off the event. The SECAF, AFWERX leadership, AETC Commander, and Mayor of Austin

attended the first official day of AFWERX-Austin. We were open for business!

Six months into the job, our AFWERX-Austin resourcing was still lean. However, through our resourcefulness, our team was able to scale up projects because collaborations with AETC enabled the necessary personnel and a small budget. Looking back, we were able to cover a lot of ground considering that AFWERX-Austin lacked dedicated manning and anything resembling a budget until late 2018.

If you are a startup with a short runway, take heart! Dire conditions breed resourcefulness and invention. Although you may wish for the mirage of safety that accompanies a bloated, ineffective bureaucratic organization, it can be pretty rewarding to figure out how to solve issues with the intense constraints of a resource-deprived environment. AFWERX-Austin was hugely successful after 18 months by any measure.

SCALING CUSTOMER INTERACTION TO MEET GROWING DEMAND

Hypothesis: Within the SBIR Open Topic program, if we create a positive experience when collaborating with companies, then they will become propensed to become influencers/advocates for others to participate.

Within SBIR Open Topic 19.1 and 19.2, we experienced two friction points within a company's experience of AFWERX. It became very evident within 19.1 that responding to separate emails from 120+ companies was not efficient or sustainable if we were going to increase the company footprint in the topic. Also, from a peer review standpoint, we didn't fully understand what would require additional contracting coordination after the technical reviews. This led to a significant delay in awarding Phase I contracts—for some, the delay was in

excess of 60 days. These two problem sets resulted in lessons learned for the AFWERX SBIR team.

To assist our collaboration efforts, we set up a platform that allows companies to work with each other on issues while the AFWERX team can focus on providing current information. This resulted in a significant decrease in email queries from companies as well as the majority of companies receiving responses in minutes versus hours. Additionally, for our 19.3 SBIR Open Topic process, we solicited additional technical reviewers. This allowed us to accomplish reviews in record time, and resulted in more time available for contracting to review proposals, which produced the net effect of faster processing of the awards.

"People don't live in Austin to work; they work there to live."

AFWERX Challenge
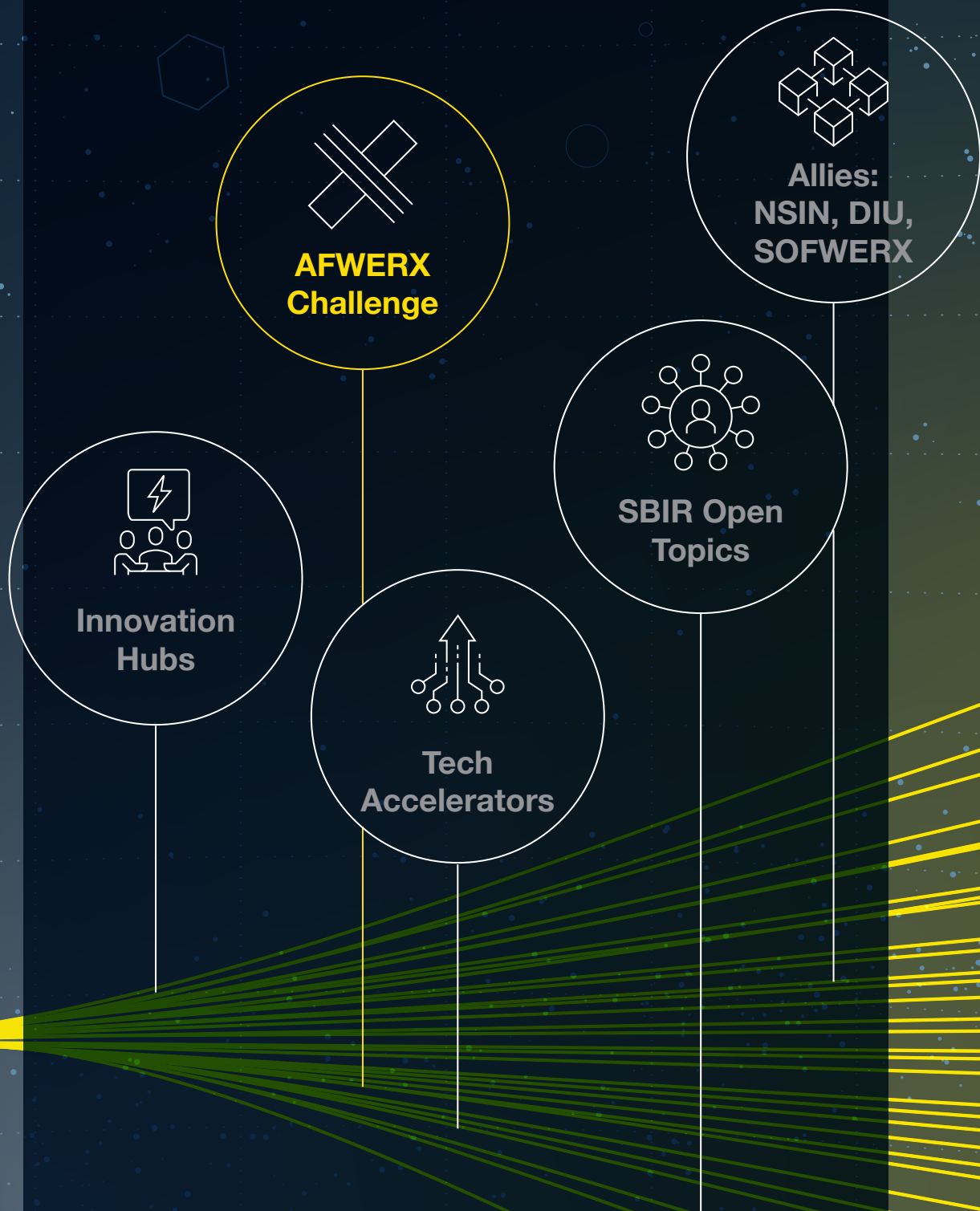
AFWERX Challenge

Allies: NSIN, DIU, SOFWERX

SBIR Open Topics

Innovation Hubs

Tech Accelerators

> **Our job is to make change. Our job is to connect to people, to interact with them in a way that leaves them better than we found them.**
>
> SETH GODIN

THE PURPOSE OF THE AFWERX CHALLENGE PROCESS

AFWERX Challenge is used to connect Airmen with problem sets to solutions from non-traditional industry at the speed of relevance. We are typically able to present a USAF customer a curated list of companies that can be contracted with to solve the problem within 24 weeks.

It enables individuals, startups, small businesses, large enterprises, academics, and research labs to submit solutions that solve problems for the U.S. Air Force (USAF). With each challenge, we grow the military/business/academic ecosystem. Most of the challenges are open, seeking to facilitate dialogue and collaboration within that ever expanding ecosystem. Participants can usually see, comment, rate, and community vote on submissions. AFWERX Challenge does not ask for IP, trade secrets, or financial information to be disclosed publicly.

A BRIEF HISTORY

In early 2018 AFWERX-Vegas hosted a workshop to understand the challenges of providing security to permanent bases, temporary bases, and mobile assets. The ultimate objective of this project was to identify

some innovations in the private sector that could assist USAF in its mission. During the workshop the idea was hatched to use a crowdsourcing platform and a traditional marketing program to reach individual innovators, academia, and companies in the private sector who had not worked with the government before. AFWERX Challenge was born.

Over the next three weeks, we launched a website called AFWERXChallenge.com, which would be used to advertise our challenges. The site would also serve as a crowdsourcing platform that would allow companies to submit solutions and then vote on their ideas transparently.

Since then we have evolved the AFWERX Challenge process into a series of stages:

1. *Scoping Workshop*—An initial meeting with many of the USAF stakeholders

2. *Challenge Definition Workshop*—A two-day design thinking workshop with SMEs from industry, academia, and government to define the challenge

3. *Open Crowdsourcing Campaign*—An open call for solution submissions, treated as market research

4. *Initial Evaluation*—Government evaluators select the top submissions to be invited to the Challenge Showcase

5. *Challenge Showcase*—An expo-styled event for selected teams to showcase their solutions and privately pitch to the government evaluation team

6. *Prototyping Phase*—The execution phase of prototype development and testing with the USAF team

7. *Program Office Handoff*—We work with the appropriate program office to handoff promising prototypes for ongoing development

KEY HIGHLIGHTS

Here are some stats on what we had accomplished by the end of 2019:

9 challenges completed

249 companies invited to showcases, most of which had not previously worked with the US Government

$33.5M in contracts and awards

48 prototyping contracts

28 prototypes developed

The figures above do not include the data for the 14 additional challenges that are underway at the time of this writing.

WE HAVE WORKED ON TOPICS SUCH AS:

Developing 14Nm microelectronics to inspire the design ecosystem in the US

Identifying methods to scan concrete to check for concrete cancer in bunkers

Finding new designs for the helmet worn by Airmen (other than an F-35)

Finding technology to allow new ways to maintain aircraft and similar functions

Identifying methods to assess whether an off the shelf product carries a threat to national security

Identifying new ways to train pilots leveraging new technologies

Improving the security and defense of our bases

Creating a culture of innovation on a base

Improving Airmen, family. and community wellbeing

And more!

LESSONS LEARNED & INSIGHTS SHARED

Knowing your audience and satisfying their needs is critical to a successful challenge

When we launched AFWERX Challenge, we decided that we would seek to make the process of engaging for non-traditional industry as easy as possible. This meant we had to go against the traditional government processes which was a risk but it has certainly paid off. Here are some of the strategies we took:

We decided to write for a 10th-grade student. This meant writing in plain English with few acronyms or government jargon as well as being clear and succinct.

We aimed for a two-hour submission timeline, so a team who only saw the challenge the day before the close of submissions could still have a chance.

We made the submissions process transparent so all submitters could see everyone else's submissions to foster collaboration (we also allow submitters to upload a private file should they choose).

We responded to all solution providers within two to three weeks to let them know if they were successful in moving forward to the showcase event. We also held webinars to answer any questions. We wanted to be transparent and also timely in our communication.

At the showcase event, we gave everyone the same space on a public floor and then took each team for private discussions, this created a space for collaboration of teams as well as giving the opportunity of a one-on-one discussion.

We tried to be clear in our communication of "what's in it for me" so that potential submitters could quickly assess if the project was worthwhile.

Partnering with the Program Office and Legal/Contracting is critical

The teaming and strong involvement/support from the government Program Management Office (PMO) is paramount to the success of a project. It really is a team effort.

Working closely with contracting and legal SMEs with the Air Force is critical. There are so many potential pitfalls that can be anticipated and avoided if you work closely with contracting and legal support.

Building a supportive working environment and culture with AFWERX, PMO, and legal/contracting teams is both more fun and more effective.

Research to identify companies that may be interested was shown to be crucial

Initially we partnered with AFWERX-DC and VT-ARC to provide research for a challenge project.

This proved invaluable in identifying potential SMEs to attend workshops and also companies and industry associations that we could connect with to spread the word about the challenge.

Leveraging social media and using high quality design and visual elements were important to driving outreach

AFWERX Challenge has always been well designed, this was a critical step in our outreach to industry who had never worked with the government before. We wanted to make the brand look very different from traditional government programs so as not to deter people too soon.

We have leveraged social media platforms to spread the word and created posts that we could share with people so they could easily share the story of the challenge to their networks, in the same way we created materials that industry associations could email on our behalf to their members.

For each challenge, we ensured the title of the challenge made sense to a lay-person (remember our 10th-grade student). We prefer literal titles that imply the subject matter rather than cryptic acronyms or terms regular people would not use.

In this next section, we thought that we would share the story of two of our recent projects to give a sense of what an AFWERX Challenge entails and also lessons learned from specific projects.

EXAMPLE 1: NEW FIXED-WING HELMET SYSTEM FOR AIRMEN

This project launched after a conversation at the 2018 AFWERX Fusion Event, where it was shared that USAF had tried unsuccessfully to attract enough interest from industry for this project.

A workshop at AFWERX-Vegas with 70 industry experts, USAF procurement, Airmen, and academia was held to explore the problems of the current helmet and the outcomes the Air Force was looking for as well as draft a challenge statement that industry could respond to.

The Fixed-Wing Helmet Challenge statement was released on AFWERXChallenge.com for six weeks, and resulted in 101 submissions via our crowdsourcing platform.

Participants encompassed a wide range of industries and institutions such as the NFL, motorsports (NASCAR, Formula 1, MotoGP), cycling, motocross and textile manufacturers. We also had participants from academia, the Consumer Product Safety Commission, SNELL Foundation, DoT (Department of Transportation), and traditional military providers.

The top 37 solutions were invited to the showcase event. At this showcase, a range of solutions were evaluated by criteria outlined in the original workshops by a panel led by AFLCMC/WNU with the support of various SMEs, ATAC, and AFRL. This showcase was well received by participants who cited the value derived from the depth of connections. Those connections continue today in support of other DOD agencies and other commercial opportunities.

10 solutions were selected to enter into the prototyping phase. Three of the 10 were "full system" solution providers, while the remaining seven finalists were component solutions.

In May of 2019, the three "full system" solution providers officially delivered their helmet prototypes to the Air Force. This successful event was held in the AFWERX Las Vegas Hub and included closed presentations of the final prototypes to USAF and other military services. This event celebrated the companies successes in developing a new helmet prototype in less than six months, at a fraction of the expected cost based on traditional approaches.

One helmet prototype was comprised of nine separate companies collaborating to bring the art-of-the-possible into one helmet system while a different prototype was entirely developed in-house by a single organization.

EXAMPLE 2: MIXED REALITY PLATFORM CHALLENGE

The origin of this project was the 2018 Spark Tank where Master Sgt. Thomas Crider of the Memphis Air National Guard Base in Tennessee presented the idea of an augmented reality training system for maintainers called "MOTAR" (Maintenance Operations and Training Augmented Reality).

A two-day workshop was held at AFWERX-Vegas involving AF Maintainers, industry, and academia. The goal was to understand the problem, the outcome, and also obtain solution ideas.

The scope of the MOTAR project was ambitious from the start. Through the Challenge Definition Workshop, with help from theDifference facilitators and crowdsourcing experts, we were able to break down the core issues and begin tackling them one at a time.

After the workshop the challenge statement was release on AFWERXChallenge.com for six weeks and 120 submissions received.

Following the challenge, 17 teams were invited to the challenge showcase event held at the AFWERX-Vegas Hub, from this three teams were selected for Phase 1 platform development.

Two teams were brought together to continue Phase 2 development.

SBIR Phase 2s were part of the fund to develop the platform beyond the original limited prototyping budget.

The team is working to roll the platform into the "Maintenance Training Next" program.

In addition to executing the challenge, an AR/VR development studio was launched at the Memphis Air National Guard base, managed by Senior Master Sergeant Powell Crider, the MOTAR intrapreneur. The studio has been assisting multiple units across the USAF to develop training simulations such as:

➡ C-130 radio training
➡ Maintenance Crew Chief fundamentals training
➡ Tire changes
➡ Tool training
➡ Engine run simulators for the C-130, C-5, F-16, F-15, and JSTARS airframes

Throughout the discovery process of this challenge, the MOTAR team brought together many organizations working on AR/VR initiatives in order to share best practices and resources as well as to support one another. We called this informal community of interest the "Voltron Working Group," which has forged tight relationships and solid collaboration across the training enterprise.

This project was highly supported by leadership and as proven elsewhere, significant leadership support makes a project more successful, run smoother, and stay within budget.

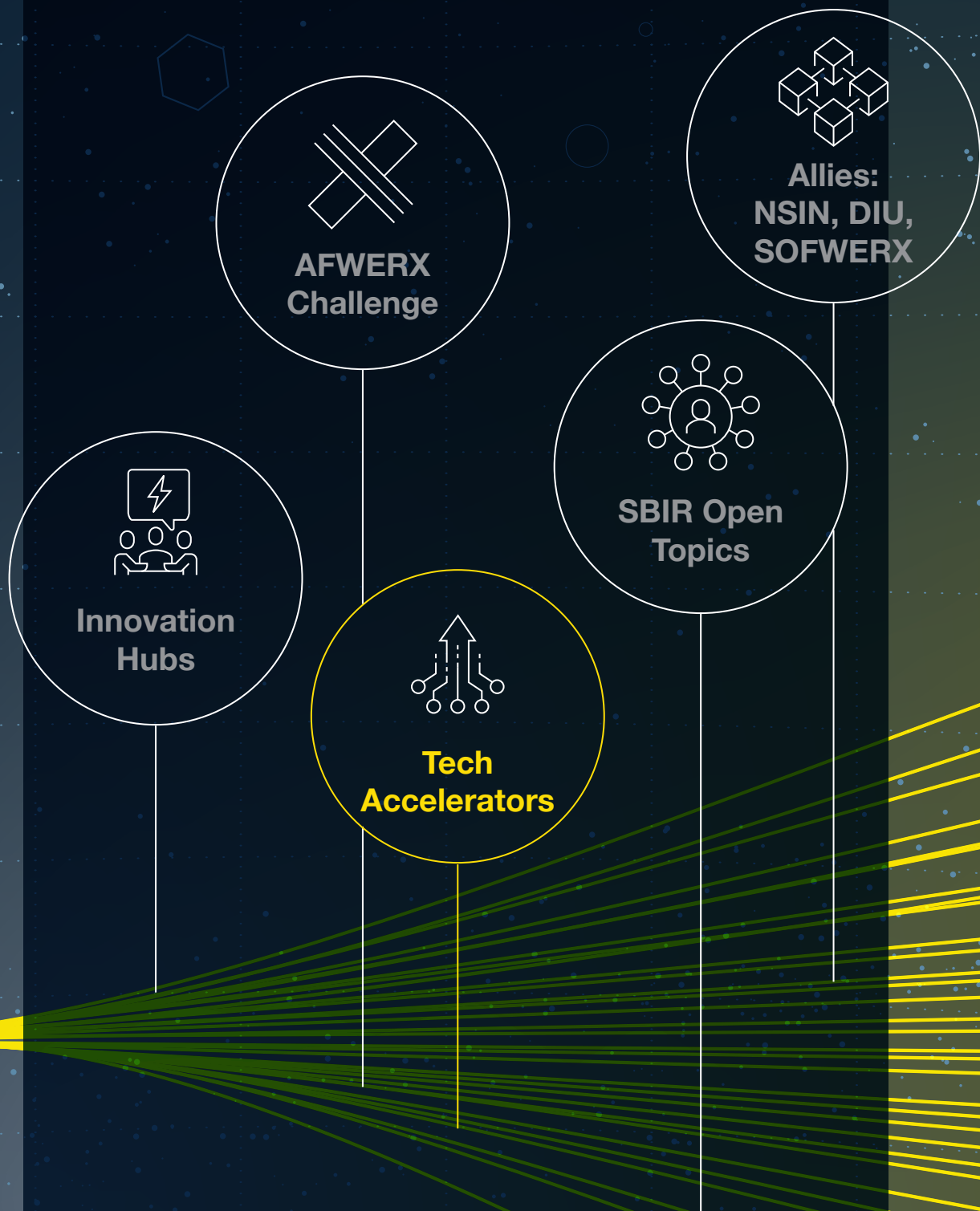"Our job is to make change. Our job is to connect to people, to interact with them in a way that leaves them better than we found them."

Tech Accelerators

AFWERX Challenge

Allies: NSIN, DIU, SOFWERX

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> "A leader is best when people barely know he exists; when his work is done, his aim fulfilled, they will say: we did it ourselves."
>
> LAO-TZU

THE PURPOSE OF TECHNOLOGY ACCELERATORS

Provide the Air Force the ability to influence technology development with startup companies while simultaneously lowering government risk and costs through partnership with private sector support.

KEY HIGHLIGHTS

AFWERX ran two technology accelerator cohorts, one in 2018 and one in 2019. These two cohorts of 10 companies each pursued "dual use technologies"—technologies that would be of interest to both the private sector and government. Combined the two cohorts have shown a greater than 10x growth in investments by the private sector and the government since we first invested in their technology accelerator experiences, adding credibility to the claim that we have picked companies with valued technology.

LESSONS LEARNED & INSIGHTS SHARED

Innovation is a team sport, requiring a team of skills and personas

This chapter begins with a tribute to the brilliance of others—five others to be precise. Those people are assigned personas, which I believe can (and should) be replicated in any large organization seeking to bring about disruptive change. Our technology accelerator capability was first formed thanks to "The Champion" persona manifested by General Goodfellow below.

Gen (ret) Gerald 'Krusty' Goodfellow—The Champion

Joined the Air Force: February 1990; Retired: July 2019

We would not be here without Krusty. True servant leadership—the kind that involves risking large amounts of your own time and personal capital to enrich the lives and careers of the people around you—is hard to come by. Gen Goodfellow has it in spades. While the Commandant of Squadron Officer College (SOC), a Professional Military Education course for U.S. Air Force Captains, Gen Goodfellow created a pathway for young Officers to pursue their innovative ideas; he called this program the "Think Tank."

The process goes like this: at the beginning of the 6.5 week SOC program, Gen Goodfellow poses a problem of strategic importance to the entire class of 600–700 Officers; those that wish to try their hand at solving the

problem have a quick turnaround (1–2 days) to draft up two pages on how they would approach it; three teams of 7–10 people are assembled based on those responses to work together over the course of SOC to propose a solution; at the end of the program, all three teams pitch to SOC leadership in stages (each time, getting a step closer to the boss). Here is the kicker—if a team's proposal is good enough, Gen Goodfellow may champion the team on their journey to implement the solution.

Having a process to facilitate radical teaming, surface great ideas, and drive effective communication is good, but the last step is key. Gen Goodfellow took this step very seriously. The Tech Accelerator team first proposed the idea at one of these Think Tanks, and afterward, Gen Goodfellow became our champion. He put his own credibility on the line by providing introductions to senior leaders across the Air Force and greater Department of Defense for over a year (even after he had moved on to a new position in the Air Force). Even when we failed—and in the beginning, we failed quite a lot—Gen Goodfellow stuck by us, and helped us to fix the things we got wrong.

Actionable advice for leaders: Create a pathway at your organization for innovators to fast-track their ideas and PUT YOUR WEIGHT BEHIND IT. The word will get around that you are serious about driving innovation, and participation will skyrocket. For those individuals that you support—even if they fail on their first endeavor (how many founders actually succeed on their first startup?), you will have shown them that leadership values their contribution, and when the unicorn idea comes along, it will be with you and not the competition.

The other personas that I mentioned (and their manifestations)?

The Whisperer—Capt Chris Benson

➡ We would not be here without Chris.

The Skeptic—Capt Austin DeLorme

➡ We would not be here without Austin.

The Architect—Lt Col Dave Harden

➡ We would not be here without Dave.

The Advocate—Dr. Brian 'Beam' Maue

➡ We would not be here without Beam.

COMMUNICATE, COMMUNICATE, COMMUNICATE… AND PRACTICE YOUR IDEA "PITCH" THOUSANDS OF TIMES!

As Senator Dianne Feinstein has said, "Ninety percent of leadership is the ability to communicate something people want."

THE SIX DEATH KNELLS—WHY HIGH-PERFORMING STARTUPS CHOSE NOT TO WORK WITH LARGE ORGANIZATIONS (LIKE THE GOVERNMENT)

Through our interactions with thousands of startup companies and investors, we have observed six consistently common reasons that high-performing startups sometimes choose not to work with large organizations. Those six reasons—I have come to call them the "Six Death Knells"—are outlined below. In the next section, I discuss how we designed a system to combat each of those six Death Knells.

Complexity

Consumers demand seamless user-experiences down to the slightest detail—a moment of confusion during a sign-up process, a misplaced menu item, or a broken link is enough to drive a potential customer away. There is an oft-repeated saying (in just about every industry): "don't

blame the user for not using your product." That holds true for the public sector just as it does for the private sector.

Our user-experience—from the moment our "user" (high-performing startup with dual-use tech) first engages with us through (at least) the completion of their first contract—must be simple and beautiful. If we want to expand the Innovation Industrial Base, adeptness at navigating a complex and hazard-prone application process cannot be a competitive advantage enjoyed by incumbents.

Timelines

Startup companies, who often have a "runway" of nine months or less, cannot wait for six months, let alone two years, to be awarded a contract. Many investors and startup mentors advise companies not to work with the government until they have enough cash flow and personnel to survive delays. Once on a commercial-only vector, they may never pivot towards working with us. Even if they do come back to us, we miss out on potentially life-saving and capability-enhancing solutions in the interim.

Requirements

Though clearly conveying our needs is important, it is possible to NOT over-prescribe a solution. If we tell companies exactly what we want them to build, rather than articulating the problem and allowing companies to come to us with their own solutions, we limit the pool of potential applicants. We also do not allow ourselves to be pleasantly surprised by solutions we did not know we needed.

Access

This is perhaps one of the biggest issues—if a company does choose to work with us, where do they start? There are roughly 685,000 people in the Air Force! This can result in frustration for both the company (who faces repeat rejections or handoffs) and the Airman (who is

often inundated with calls from vendors). What's more, the "customer" (who is responsible for acquiring the solution) is often different from the "User" (who stands to operationally benefit from the solution).

Additionally, there is often uncertainty around when it is legal for Airmen to talk with companies (in most cases it is), so even if the company finds the needle in the haystack and the Airman is interested, the connection may not be made.

As a humble answer to the access question, one possible starting point is:

https://www.AFWERX.af.mil/

Transition

Government Research and Development funding is a means and not an end for most startup founders—companies want to know that real deal-flow could result from their engagement with the government. Large organizations (public and commercial) often suffer from a disconnect between their "innovation" activities and their larger lines of business.

Sentiment

The anachronistic approach of relying on impersonal forms and processes to attract innovators will not be as effective as adding a human touch.

DESIGNING A MORE BEAUTIFUL SYSTEM

The first lesson focused on personas and the people who bring them to life. It is only suitable that the last lesson focuses on systems. The two are inexorably linked—any leader who tells you that people are the only resource that matters is leaving out a vital piece of the puzzle. Without a system that allows individuals to thrive, incentivizes productive behaviors, high-performing

individuals may become disenfranchised with your organization, or choose not to work with you in the first place (reference Lessons 3–8: "The Six Death Knells").

General

Use deliberate processes to align incentives (no bloat though!)

Don't force it; don't falsely validate a bad process with heroics

i.e. "come to AFWERX and we'll introduce you to your customer"

Five node approach—intrapreneur, sponsor, resources, contracting/legal/PA, solution partner

The most important node—the intrapreneur

Call it an experiment! Build trust, grow over time

Forced iteration—planned refresh every 3–6 months

Building for massive scale—forced ourselves to find 10x efficiencies, found 100x

Set goals that cannot be met with incremental improvement—forces tangential thinking

Mass Program Management-ing allowed us to manage hundreds of companies at once

Automate processes where possible
Ex: debrief letters (autocrat and mail mergings)

Assembly-line evaluation approach (one evaluator per criteria)

Design is what you say 'no' to, so be sure to have:

Brevity

Beauty

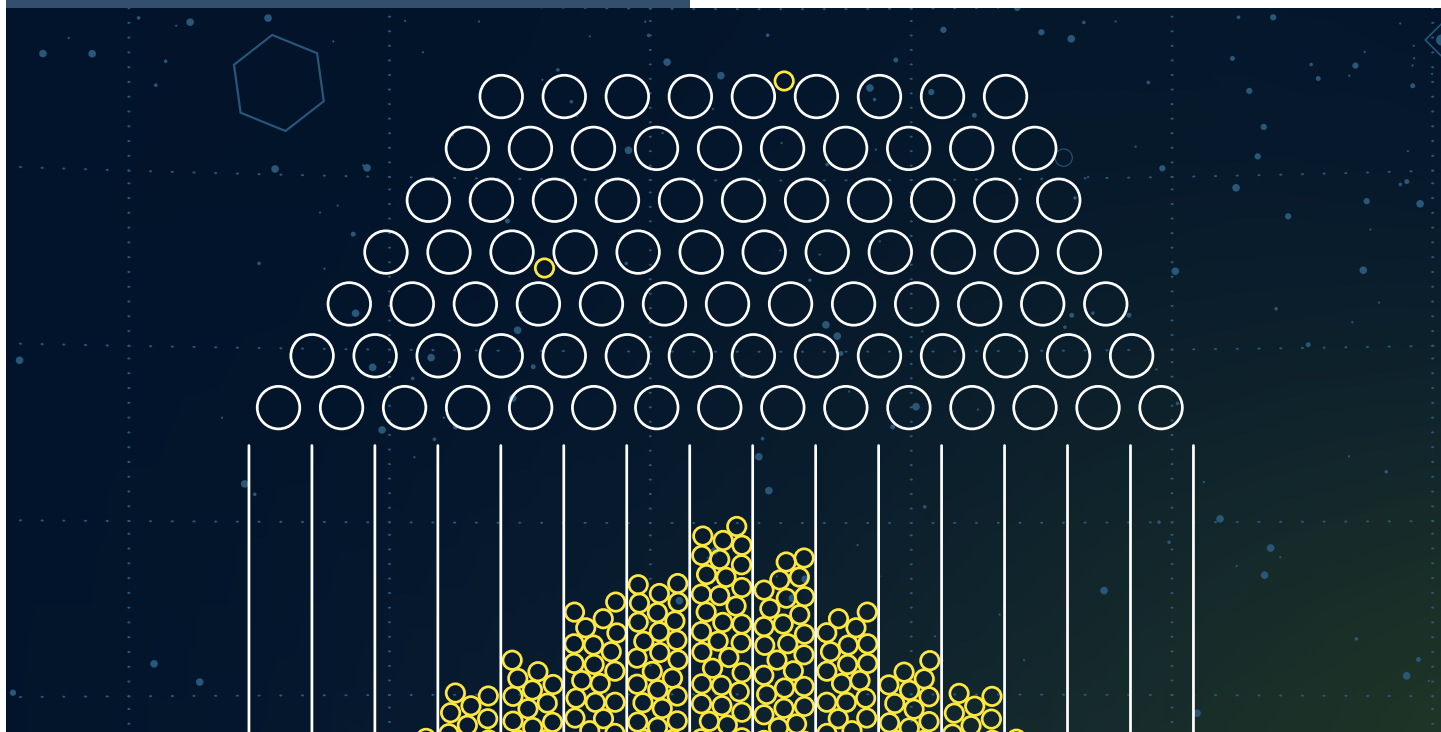Your story (e.g. 100 second video)

Probabilistic vs. deterministic

It is a mindset. We will not predetermine what innovators should present to us. Instead, we will seek a large array of inputs and submissions, and maintain a comfortable risk level that the Law of Large Numbers will favor a few big wins coming out of the large pool of possibilities.

Use the paper trail to your advantage (what!?!?)

We benefited from adding an AF Customer Memorandum to some of our processes. This required companies to find a "customer" who was interested in their technology. By holding submitting companies accountable to find a customer who would sign a letter stating that the technology was of interest to the Air Force, we accomplished vetting while also expanding the Air Force's ecosystem and insight into various innovation methods.
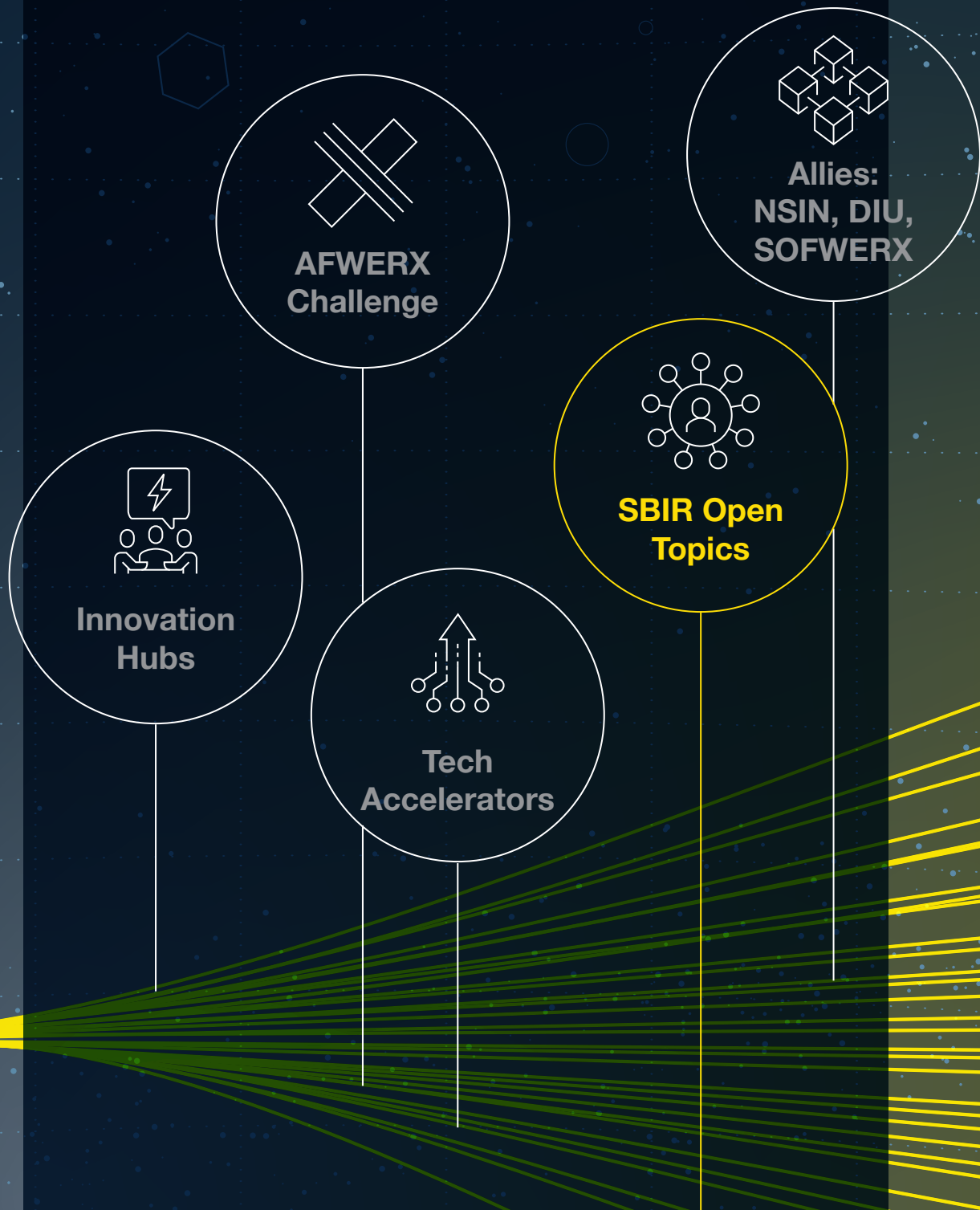
"A leader is best when people barely know he exists; when his work is done, his aim fulfilled, they will say: we did it ourselves."

Part 2: Connecting with Real Options

SBIR Open Topics

now evolved to Air Force Ventures

AFWERX Challenge

Allies: NSIN, DIU, SOFWERX

SBIR Open Topics

Innovation Hubs

Tech Accelerators

PART 2: CONNECTING WITH REAL OPTIONS

SBIR OPEN topics, now evolved to Air Force Ventures /// Captain Chris "Bubbles" Benson /// Captain Steve "Elmo" Lauver /// Captain Jason "NAPA" Rathje

> ## Humanity needs to get better at knowing how to get better.
>
> **PATRICK COLLISON & TYLER COWEN**

SBIR OPEN TOPICS was the running title we gave to an alliance between:

> Air Force Research Lab's Small Business Innovation Research Program (AFRL/SBIR)
>
> Assistant Secretary of the Air Force for Acquisition, Technology and Logistics (SAF/AQ)—Delta and Ventures offices
>
> AFWERX

...this alliance has evolved and was renamed *"AF Ventures."*

The Purpose of SBIR Open Topics and now AF Ventures: AF Ventures leverages Small Business Innovation Research (SBIR) funding and private capital to deliver military capabilities and grow the US economy. In parallel, we are able to work with other areas of AFWERX and the broader Air Force in pursuit of supporting greater warfighter agility.

KEY HIGHLIGHTS

During 2018–2019 (2018's SBIR 18.2–2019's SBIR 19.2), we achieved:

> 700 companies on contract, most of whom had never worked with the government before
>
> 970 contracts in total for projects to benefit the warfighter with those 700 companies
>
> Average of ~30 days from solicitation close to on-contract
>
> $242M on contract utilizing SBIR Funds
>
> $83M in matching funds ($63M private, $21M Gov)
>
> 186 SBIR Phase II Trials: Self-selected, committed stakeholders and innovative small businesses solving real customer needs

LOOKING TO THE FUTURE, OUR GOALS INCLUDE:

> Within three years: Create one new dual-use Unicorn per year
>
> Within five years: Create three new dual-use Unicorns per year
>
> Within 10 years: Create 10 new dual-use Unicorns per year

LESSONS LEARNED & INSIGHTS SHARED

Matching problem possibilities with many possible solutions (N:N) is much more powerful than launching one requirements statement into a pool of companies (1:N)

Traditionally, when the Air Force has sought a new capability, we create a number of working groups and review committees focused on creating requirements and analyses for that one capability. This approach of breaking up a technology challenge into one very specific set of requirements, and then asking companies to try and create very specific answers for that very specific requirements set has at times appeared to be too constraining and too slow (some will say "sometimes," some will say "too often").

The guiding principle for AF Ventures was to match problems (within the Air Force) with solutions (from an expanded ecosystem) by bringing all of our problems to the forefront and having companies find a match with ANY of those problems. This type of innovation demand and supply matching was theorized to be orders of magnitude more effective than the present approach one very specific requirements request at a time. Our theory has been proven by the data.

We created a collaborative effort with AFRL's Small Business office, SAF/AQ's Venture and Delta offices, AFWERX, and more to experiment with our theory by announcing multiple ("N") sets of technology challenges for which the Air Force was seeking solutions on the Small Business Innovation Research (SBIR) "Open Topic" website.

This "marketplace" approach to matching technology demands with a supply of innovation solutions has been successful at an 80%+ matching rate. How effective is "80% matching?" As a contrast, consider what happened when we helped run our first, single-solution

Pitch Day event. This was a public gathering designed to bring in companies for a very specific problem. The event even included extra marketing and messaging boosts from high level guest speakers, a marquee event location, and highly visible marketing efforts. Even with all of these added advantages in the event's favor, the best result was only a 25% matching rate for the very specific, smaller set of problems.

Although it is early (AFWERX is two years old as of this writing, and AF Ventures work with SBIRs matching techniques is one year old), the consistent, growing success of AF Ventures approach suggests that we as a military should NOT start with a requirement for a single problem. Instead, we should start to think about building a platform that allows for efficient, effective, and ethical matching between AF problems and innovative solutions.

PERMISSION-LESS INNOVATION IS KEY FOR LONG-TAILED SOLUTIONS

One issue that you have with many bureaucratic innovation systems is that they rely on "experts" to evaluate whether something is good or not. This use of "experts" is designed to cut-off the very bad solutions. However, at the early stages of innovation, the difference between a very bad solution and a very good solution is hard to distinguish. Thus, it is important to avoid having a small number of "gatekeepers" who may, by the simple fact of their small numbers, become a very limiting decision authority when it comes time to decide which innovations should be supported for additional development.

We have allowed a broader, more open system of expertise within our Open Topic process by using Memorandums of Understanding (MOUs). Anyone in the Air Force, from an E-2 all the way up to O-10 can sign an MOU. The MOU provides an opportunity for the end-

PART 2: CONNECTING WITH REAL OPTIONS

SBIR OPEN topics, now evolved to Air Force Ventures /// Captain Chris "Bubbles" Benson /// Captain Steve "Elmo" Lauver /// Captain Jason "NAPA" Rathje

user and solution provider to work together to define a trial that will test to see if the solution will actually solve the needs of the specific user. This means that a great idea just needs *one* believer, and that believer can be anyone across the Air Force. This essentially allows everyone in the Air Force to become an innovator, and it opens up the amount of innovation options available to the Air Force.

Does this mean that the AF Ventures group and the Air Force initially accept more "losing" ideas than would have resulted if a panel of experts had been the initial proposal reviewers? YES! ...and that is okay, because the bigger risk is not performing a large number of low-dollar trials (knowing that some will not succeed) and subsequently missing out on the 'next big thing' that could change the warfighting domain.

IT IS MUCH EASIER TO DISCUSS NEW THINGS IN CONCRETE TERMS RATHER THAN HYPOTHETICAL TERMS

Whenever you start to do something new and a group of people who are used to doing things another way see your actions, their initial reaction is to try to find things wrong with it. This is especially dangerous if you are bringing the idea while it is still in a hypothetical status, as this can allow the skeptics to start a process of 'what-if' or 'what-about' probings and they can find an infinite number of reasons why a certain idea cannot or will not work. This spiral can last for months and can result in nothing concrete being accomplished.

In contrast, we have found it much more helpful to bring new ideas with concrete details so that we can all focus on solving a specific problem, instead of trying to solve every possible permutation of a general problem. This is analogous to trying to solve a mathematical proof (which can be quite difficult and may not be possible), as

opposed to a single calculation (which just takes a bit of work, but is always solvable).

An example of this can be seen when it comes to determining how to vet venture capitalists and their limited partners for foreign intervention or ownership. When asking folks how this should be done, everyone has different opinions and you can spend ages in the Pentagon talking about how to do this. We have chosen NOT to engage in the discussion of theoretical situations and are instead waiting until we have concrete details around specific companies who have specific investors, and then we work together with the various stakeholders to figure out if and how we can safely and effectively work with them.

THE TWO BEST WAYS TO SPEND YOUR TIME

One of the main enablers of AF Ventures existing and expanding is the fact that we had some free time to experiment. We were okay with trying things that, at first, did not have a high probability of succeeding. Now how were we okay with this?

One of the main reasons we were okay with this was that we had extra time with which to experiment and explore. The SBIR 'Open Topic' concept was taken from the 'Open Topic' from the UK's Defense and Security Accelerator (DASA). The only reason we were able to learn more about this was that we had time to read and dig deep on what other people were doing. So how did we have so much time?

The reason why we had time is because we effectively prioritized how we spend our time. There is a nice saying

at Y-Combinator that says you should try to minimize your time spent on things that are NOT:

→ Talking to your customer
→ Building your product

Talking to your customer: For AF Ventures, our customers are the startups AND the end-users, which is why each of us still spends a lot of time answering questions from companies and replying to emails and we still hold many "Ask me anything" Q&A sessions to get their honest feedback.

Billing your product: For AF Ventures, our product is the streamlined SBIR process with shorter applications, rapid contracting, and portfolio-scale investments. So whenever we are working to streamline the contracting process, or fighting for resources, or writing more clear instructions, then we are working on our product.

BE WILLING TO KILL YOUR DARLINGS

The Air Force Ventures initiative was originally built upon the back of the Technology Accelerator capability at AFWERX. The idea came out of necessity as we wondered how we were going to transition the companies that were coming out of the original accelerator. When we were first going around to pitch the AF Accelerator idea, we were very excited that the 10 companies within a cohort would be receiving over $1M of private investment combined. At the time (2016), this was a lot of money for private investors to put towards companies that were working in the defense environment.

Fast forward three years later and we are on the verge of attracting over $1 Billion (yes…billion) of private capital towards our AF Ventures companies. At the same time, after three years of running a technology accelerator, we now realize that the accelerator has served its purpose

and is not the most optimal use of our limited resources. Many other organizations are now running "accelerators," so we are able to direct more of our focus on other, larger dollar innovation capabilities.

Thus, even though the accelerator was one of our first 'darlings' and it was a founding capability of AFWERX, it is time to say goodbye. What other 'darlings' might each consider shutting down, so that we can free up AF resources toward better uses?

WHEN EVERYTHING IS YOUR PRIORITY, NOTHING IS A PRIORITY

Rank-order resource investments. If not, expect to perish in diluted efforts.

CONCLUDING THOUGHTS:

Over the last 30 years, we have seen consolidation within the defense industry, resulting in less competition. Our mission includes helping to reverse this.

Two critical domains of war in the next 30 years will be technological and economic. If we do not have influence over, or access to, the critical technologies of the next generation (i.e. quantum, AI, space, biotech, autonomy) then we will be at a much higher risk of losing to adversaries in the wars to come.

The amount of private capital towards R&D is now five times that of defense funding towards R&D. If we are to stay technologically relevant moving into the future, we must learn how to LEVERAGE those funds and INTEGRATE the results.

**"Humanity needs to get better at
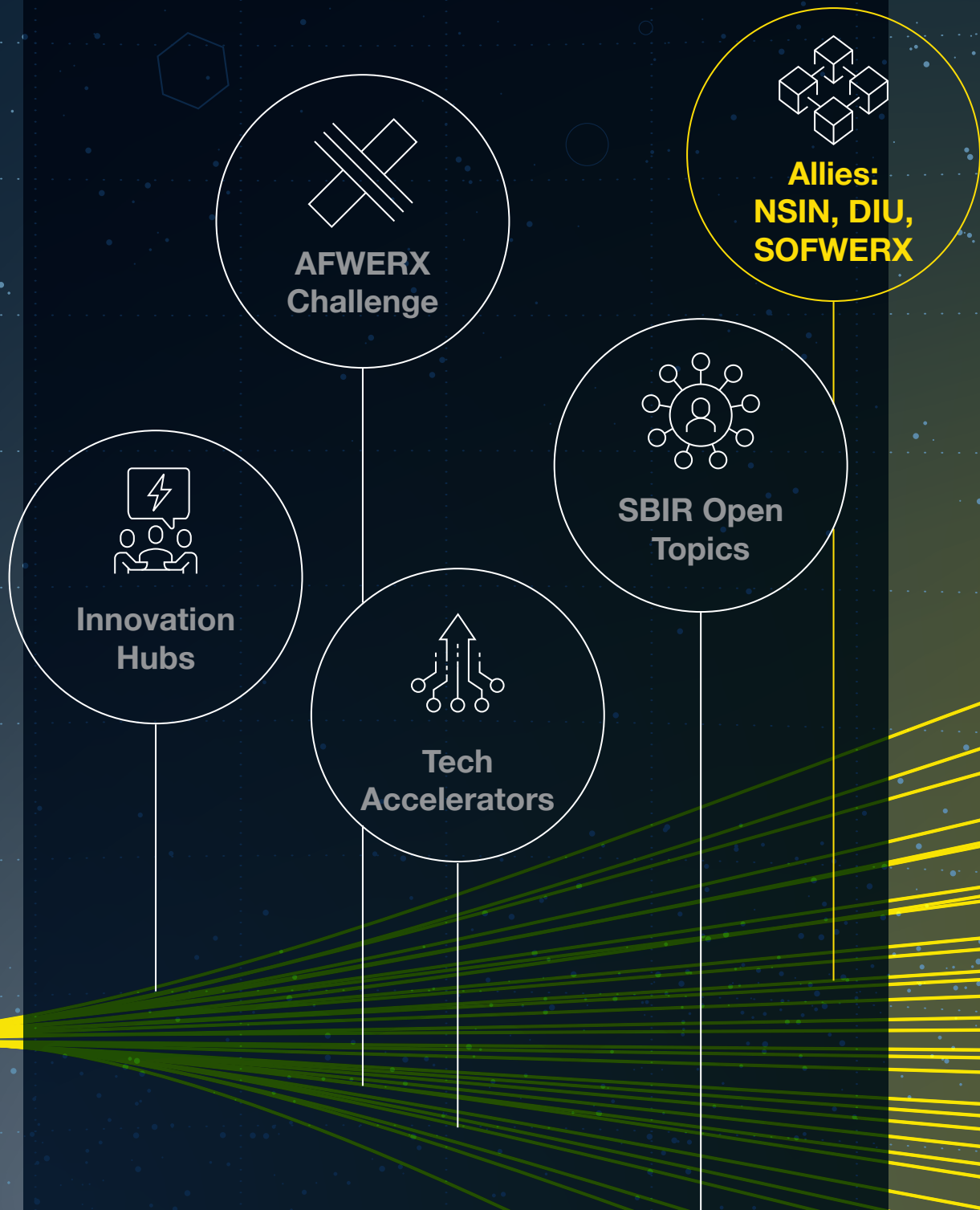knowing how to get better."**

Allies

AFWERX Challenge

Allies: NSIN, DIU, SOFWERX

SBIR Open Topics

Innovation Hubs

Tech Accelerators

> "
> ## I don't need a friend who changes when I change and who nods when I nod; my shadow does that much better.
> PLUTARCH
> "

THE PURPOSE OF ALLIES

Relationships which pursue a common set of interests through voluntary contributions of resources.

No one travels the innovation road alone. The addition of allies to aid in the experimental journeys has been integral to AFWERX's success, and so is mentioned on our innovation demand and supply graphic, as well as the stories contained within this book.

We dedicate this page to an uncountable, and unlistable, number of allies who have helped advance innovation for AFWERX, our Air Force, and our Nation. As you have probably surmised by now, AFWERX had a very, very

lean beginning of under one dozen people. Subsequently, we have worked to be value-adding partners to a number of other people and organizations, providing value-adding, win-win opportunities for each of us, sometimes at the same time, sometimes as gifts of good will, and always with a humble spirit of sharing credit and giving thanks that others are also engaged and working to keep our Nation and our way of life defended.

The good fortune we have experienced has been critical to our mission's success, and we believe helpful to our partners.

We give thanks for their sharing in the journey.

> **"I don't need a friend who changes when I change and who nods when I nod; my shadow does that much better."**

PART THREE
Transitioning Solutions

AFWERX

Agile Contracting and Acquisition

Agile Contracting and Acquisition

Public Affairs

Coaching and Facilitation

"
Delivering performance means we will shed outdated management practices and structures while integrating insights from business innovation.

2018 NATIONAL DEFENSE STRATEGY SUMMARY
"

THE PURPOSE OF AGILE CONTRACTING AND ACQUISITION

Connect innovators and accelerate results through outreach and the exploration of agile acquisition pathways that take into account the entire lifecycle of an acquisition and leverage the motivations of the acquisition stakeholders.

KEY HIGHLIGHTS & HISTORY

AFWERX did not have any contracting authority when it was created in 2017. Instead, AFWERX had to rely upon a number of contracting organizations to bring together the totality of projects. The Agile Contracting and Acquisition capability of AFWERX brought together numerous stakeholders to advance projects towards creating greater agility for the Air Force, including supporting many of the "Base of the Future" initiatives. AFWERX has since gained full-time contracting support.

LESSONS LEARNED & INSIGHTS SHARED

Avoid the short-term "Easy Button"

While reading this book, you might ask yourself, "What is Agile Contracting and Acquisition, and why is it important to the AFWERX mission?" If you do, that's okay, you are probably in the majority since AFWERX did not (at the time of writing this) have acquisition authority. We have since begun adding full-time acquisition support, but that was not part of our founding.

Conceptually, AFWERX's objective is to be a culture change initiative for the Air Force. We executed this objective by connecting innovators and accelerating results, not by doing acquisitions for teams. The necessity to collaborate with organizations across the DOD enterprise to accomplish acquisitions (both core mission and for AFWERX mission partners) was made much more challenging by AFWERX's lack of acquisition authority, but it also provided a forcing function for AFWERX to ensure that it was offering a value-adding proposition so that organizations would voluntarily fund the innovation project and acquire it in an agile way. This is how we—together—bring about culture change.

Teams that wanted to work with us were forced to think outside of their traditional organizational structure and reach out across the silos of government to accomplish their Agile Contracting and Acquisition goals. AFWERX participates in the acquisition strategy with teams and through its ever-expanding AFWERX network of innovators from all walks of life. This ecosystem empowers enterprise-level contracting to occur across all areas of the DOD.

When AFWERX acquires acquisition authority, the short-term benefit could very well turn into a long-term harm of providing an "Easy Button" for Air Force Acquisition and allow the rest of the Air Force to remain unchanged in terms of embracing Agile Contracting and Acquisition. This would cause our primary objective of culture change to be left unaccomplished with regards to Air Force Acquisition. We want to remain vigilant to stay agile, even as we acquire greater contracting capability.

BROAD STAKEHOLDER KNOWLEDGE + MINDSET = BELIEVABLE UNICORNS

Contracting and Acquisition is often seen as a slow and arduous functional that is full of odd rules and conflicting standards. The stories of unicorn-like Contracting Officers that are able to magically do things that other Contracting Officers are incapable of doing proliferate the government and add to the confusion about the Contracting functional.

Too many warfighters have been fed the normally inaccurate statement that they do not have the goods and services that they need because of their Contracting Officers. In reality, many years and many accompanying layers of rules and regulations have built an iron cage of bureaucratic processes. This contributes to an appearance that the acquisition system delivers ineptitude to our warfighters, leading to more than a few moments of sarcasm and ironic jokes about our government acquisition system. For all of these reasons and more, Agile Contracting and Acquisition mentorship is a core capability within AFWERX.

Defining Agile Contracting and Acquisition can be difficult due to the perception that the terms are effectively buzzwords. Even once explained, questions still abound regarding what "Agile" really means. This is not because the definition is complicated; it is because until Agile is experienced, it is almost impossible to believe. Agile is an acquisition mindset that holds the following to be true:

> An integrated stakeholder team with a holistic view of the acquisition (from concept development through sustainment) and knowledge of the acquisition guard rails can make just about any acquisition possible within just about any timeline necessary to support the warfighter.

Wait, does that mean that everything can happen simultaneously and no one ever has to factor time for Contracting? Absolutely not. It means that collectively, the acquisition stakeholders are responsible for the speed at which an acquisition is accomplished and the quality of the associated goods/services that are delivered. If the collective group of acquisition stakeholders wants something tomorrow, it can be done. However, having the collective group of stakeholders decide on a delivery schedule and what is to be delivered in any time-frame is normally the integrated step where the acquisition process falls apart.

The key component of the Agile process is a knowledgeable, integrated stakeholder team. Who are the stakeholders? They are any people and entities that have an interest or stake in a given acquisition. Does this mean Congress and the Taxpayer are stakeholders that need to be integrated onto the team to achieve Agile Contracting and Acquisition? Absolutely! However, in most cases these entities have provided proxies to act in their stead.

Congress and the Taxpayer are present through the understanding of law, regulation, appropriation, oversight, and a reasonableness determination. In most cases this means that it is important to have an attorney, policy expert, financial expert, leadership, and a Contracting Officer on board with any given acquisition. The warfighter (end-user) and product goods

or service providers (contractors) are stakeholders in every acquisition as well. From that core team, others can be added based on the requirements of a given acquisition such as Security, Logistics, Engineering, Data Management, Information Technology specialties, etc.

Now that the stakeholders are identified, how do you get them to integrate into a team? This is definitively the most complicated part of Agile Contracting and Acquisition as it requires a willingness and ability to build trust. Trust can be derived in a variety of ways, such as through position power, demonstrated performance, association, accreditation, and shared backgrounds. However, the most successfully integrated stakeholder teams have trust built on relationships formed through personal interaction involving shared experiences. Many times, these trust building experiences are realized by the team going through some sort of crucible—late nights working on something of great importance on an expedited timeline, navigating the perils of travel together, or accomplishing rigorous training as a team.

Manufacturing these shared experiences normally takes leadership commitment and resources. We have all heard a story about some four-star General who rips a team's briefing apart for a project that the team was not given sufficient time or resources to accomplish, but the project was of great importance to the General. That team goes back to the grind: working even harder, putting in late nights together, and helping each other cover down, just to make sure they do not catch the wrath of the General when they are required to re-brief him in a few weeks.

This more-common-than-it-should-be story is not about a good or bad work product or a crusty old General. It is about leadership using one of the tools that it has to force newly formed teams to build trust. There was probably no briefing that the team could have provided in its first attempt that would have pleased that General, because

that General's mindset believes that short term success without a foundation of trust will lead to suboptimal results. His (sometimes manufactured) skepticisms create the environment in which a team can go through a crucible and come out the other side better for it.

AN UNDER-APPRECIATED INVESTMENT THE GOVERNMENT MAKES… TDYS!

It might be heresy to say that the best investment that the Government makes is sending teams TDY, but when viewed through the proper lens, it becomes clear that spending money on well-structured TDYs brings a high return on investment (ROI). Close your eyes and remember the first TDY that you went on with your team…

You are excited to be traveling to a new place. The anticipation of meeting people for the first time that until this trip you have only spoken with every other day over the phone gets your adrenaline going. You are curious about the progress the team is making on their deliverables and you are thrilled to have the opportunity to get a firsthand account of the goods and services you are buying. You are nervous about the flight and a little stressed about organizing your home life to account for your time away. The feelings are different than anything you have ever encountered in your job, and although you are not sure why, you kind of like it!

It is Sunday afternoon. You arrive at the airport and fumble your way through airport security. You find your gate and start to settle into a chair awaiting the boarding process when you see Jane, a program manager from your office that is going on the trip as well. You sit together and exchange pleasantries. You quickly run out of benign things to talk about and the conversation takes a sharp turn towards all things related to work, including strategizing about the next day's meeting. The next thing you know the gate agent

is making a final boarding call announcement and you and Jane head towards the gangway.

You find your seat just behind the exit row only to realize that Mr. Smith (Tom) has already boarded the plane and will be right next to you for the duration of the flight. Tom is the lead engineer on your team, and you have not spent too much time around each other. You respect him and the leadership role that he holds within your office, but you are not sure of anything that you have in common. A big smile comes across Tom's face when he sees you. After you sit down, Tom goes on to tell you the history of the program and a few war stories from the good ol' days when we went head to head with the contractor on a Vietnam era program.

Before you know it, the flight is over. You and Tom disembark the aircraft as friends and Jane is waiting in the gate area to collect you. Together, the three of you head to the rental car pick up and discuss dinner options. Tom has been here before and recommends this great Italian place near the beach that has self-serve Chianti on the table. You drive to the hotel, check in, and decide to meet back up at 7pm in the lobby. You end up at dinner with your coworkers and you have a wonderful meal full of stories, laughter, advice, and plenty of Chianti.

You return to the hotel tired but excited and anticipating tomorrow's meetings. You call your spouse at the end of the night and explain how awesome Mr. Smith is and provide a shorthand version of the various stories that you heard throughout the night. You wake up the next morning and begin your routine. You meet your team at the hotel breakfast, everyone is dressed to impress, and you drive to the contractor's facility together. In the lobby you are in-processed by the on-site security and wait patiently for Sue to meet you and escort you back to the conference room. Sue arrives with an intern in tow. The meeting begins, and while the program slides

and charts are good, some of the technical stuff is over your head. You diligently take notes anyway and look forward to the production facility tour scheduled for later in the day.

Lunch arrives, and the contractor puts out a fair-share jar for the Government employees, and the side meetings ensue. You stay close to Jane and actively listen to the conversations that she is part of until you hear your name being called by Tom. You walk over to him and he introduces you to the CEO of the company. They used to serve together in the Air Force. You realize that this is the first time you have ever met a CEO, and you come up with some quick positive comments about his company, team, and products that they make. You finish lunch, flabbergasted that you just met a CEO—pretty cool.

Next up is the production facility tour. You have never seen anything like it. The equipment is so big and the moving parts of the production operation all seem so complicated. You feel pride that you had a hand in negotiating this contract and creating this capability for America. On the tour you notice the number of people and machines working in concert that it takes to produce the end product that you buy, and you suddenly realize where all of those millions of dollars you put on the contract are going. It has to be expensive to run an operation like this!

At the end of the day, the contractor announces that there will be a dinner social for the team at a local brewery in town. The team heads there and in the car ride, Tom provides his assessment of the meeting. You ask him and Jane for further explanation on some of the things that you did not fully understand. They explain the best they can, and their explanations provide some great clarity for you. You arrive at the brewery and find Amber and Tony waiting by the bar ordering drinks with Sue. Amber and Tony are part of your contracting team who have been negotiating on some of the engineering

change proposals. It was hard to find time to chat with them during the formal meetings today, but they are all yours at the social and are excited to share time with you. You love putting a personality to their names and realize that they are all hard workers too. You can tell that by just meeting them in person, everyone is able to empathize with each other a little better.

The night ends and you head back to the hotel. Jane and you rehash the day's gatherings and strategize about the steps you need to take going forward, and then you split off to your own rooms. When the next morning arrives, you pack your bags and head off to the airport with your team. You feel like you really are a team now and that you have gotten to know your coworkers on a deeper level. You have a new found level of respect for each of them, and the trust you have in each of them has risen. All in all, you realize that it was a very productive trip!

This TDY might have cost the Government a thousand dollars, but what did the Government get in return for this expense? Three workers intensely focused on the challenges that they have in their program during work hours and non-work hours, at no hourly rate charged to the Government. A team formed closer bonds and built trust and cohesion. Leaders mentored and imparted wisdom from their past. An appreciation for the program and an understanding of its complexities. A more committed team with camaraderie resulted. The Government received a profitable return on its investment, even if actual numbers cannot be recorded.

LEADERSHIP MATTERS— PROVIDE AGILE PATHWAYS FOR TACTICIANS AROUND FROZEN MIDDLES

When endeavoring to perform culture change, you will want to realize up front that the pathway is normally obscured from obvious view, riddled with political

landmines, and barricaded with the egos of those whose power structure you are fundamentally altering. The age-old adage that "Power seeks to preserve itself" rings ever true when it comes to culture change, especially in an entrenched culture such as acquisition. As a result, strong leaders must clearly articulate their vision for the change that lies ahead, middle managers must lead in the embrace of this vision, and tacticians must lead in creatively finding ways to implement the visionary leader's intent.

With regards to AFWERX and its Agile approach, we continue to benefit from strong leaders in the acquisition world such as Dr. William Roper, Major General Cameron Holt, and Congressional Acquisition Reform Leaders. They have set an ambitious vision to shave over 100 years off of collective acquisition program timelines, speed up acquisition decision making, increase investments in innovation, and to restructure the Contracting Officer Career Field into Mission Focused Business Leaders.

For most "middle management" personnel, this vision has been easy to understand, but more difficult to embrace. Proceeding with caution and subsequently not making many bold decisions to lean into a vision can be understandable when viewed from the history of how they learned to work within a government culture—stability and predictability are hallmarks of government processes. Yet those virtues can also be vices, and with enough persistence from the tacticians, the middle management is often willing to try low threat initiatives…initially.

It is important to note that "middle management" means something different to just about everyone, especially if you are the master of your organizational domain, but still a middle manager within the big Air Force. It is important to understand middle management as it relates to the vision at hand. For the sake of this discussion, let us consider the person who sets the vision to be the

leader. "Middle managers" are those who are below the person who sets the vision, (even if the two people are not formally, organizationally aligned) and have others beneath them who provide tactical pathfinding. These definitions may be a hard pill to swallow for many middle managers in the Air Force because so many of us are expected to lead at all levels within this culture.

When a portion of a middle management group becomes rigid in their ways of thinking and doing, they become a Frozen Middle, and a plight to innovators who are trying to accomplish something with rapid agility. Many of us, at some point, to someone, have probably created a Frozen Middle environment for some project and stymied a tactician trying to perform innovation.

The tacticians are normally the people closest to the problems and the true drivers of leadership's vision if they relate to it and believe in it. Nurturing these individuals is critically important, and leadership will normally grant them direct access. This can cause its own set of issues within a hierarchical organization like the military. It is necessary however because culture change, especially as it relates to a shift towards agility, often requires quick decision-making that can really only be executed by the vision originator, who ensures that initiatives are pushing in the right direction.

Middle management, while well-intentioned, may get in the way of this process by having a lack of trust in their subordinates or a desire to be seen as the agent of change by the visionary leader. The reality is that the best support middle management can provide to both the leader and the tactician is the infrastructure support necessary to go after a different way of thinking. This means removing barriers brought to middle management that are well within their sphere of influence, handling gatekeepers such as senior leader staff members or secretaries that are less comfortable working with tactician level employees, and telling the story of the

tacticians to the rest of the workforce. Lastly, the middle managers may act as continuity change agents for all of those projects that don't have the interest of the visionary leader but still cross the middle manager's desk.

HOW TO KNOW CULTURE CHANGE IS TAKING PLACE?

There are many indicators that culture change is afoot. One of the more common indicators is when the change agent becomes synonymous with the concept of thinking differently itself. An example of this is when other organizations go out of their way to brand things with your organization because the name association with Thinking Differently is so strong. Calling something an AFWERX Challenge despite it being merely facilitated by AFWERX and nearly completely executed by the problems owners is one way this has played out within AFWERX. This is only the beginning of the culture change movement and is also an indicator that it is time for leadership to double down.

There can be life to a culture change that was laid out by the visionary leader, but it may not have become ubiquitous. Doubling down looks like expanding the visionary leader's intent to other applications, forcing the interactions with historically rigid factions of an organization. With AFWERX, this manifested itself when leadership supported the AFWERX involvement in programs long held by a single office within the Air Force, which caused a new perspective by the traditional owners of these responsibilities. Their openness to interact with senior leadership's change agents allowed continued successes and further realized some of the visionary leader's intent in other areas.

True to form, some middle managers do not enable or drastically impede progress at first. Instead, they half-heartedly champion the visionary leader's ideas

by allowing the tacticians access to information and providing an overview of the way things had been done in the past. In many regards, the initial reaction from the rigid status quo is to turn over the reins, knowing that what they had done historically is challenging work for a number of reasons, and expecting the tactician to fail. After the first few cycles, when failure does not occur, and culture change starts to break containment and move out to the operational commands and staff support offices, the old guard may begin to push back. This is a sign that you are really entrenched in the culture change battle, and you have started to turn the tide in your favor.

Change can be difficult, and with it comes shifts in power. Given the fact that power seeks to preserve itself, this breeds conflict. Depending on what side of the conflict you are on will determine whether it is positive or negative change movement because conflicts such as these rarely result in a win-win being perceived by both parties.

The flag-carrying status quo defenders will look for a weakness in your change agent organization, and when it manifests itself, they will pounce—full of self-serving half-truths, inflammatory statements, personal attacks on individuals within your organization, and a plea to leadership that your organization be stopped…actions made with the erroneous self-righteous belief that this will be for the betterment of all that is good and the way things have been done before.

These moments of struggle are crucibles that all culture change organizations seem to experience at one point or another. It will test your nerve, it will cause you to question your noble purpose, but it will not break you. It cannot, because you have come so far, and lest we forget, you are still champion for the vision of the leaders that are calling the shots.
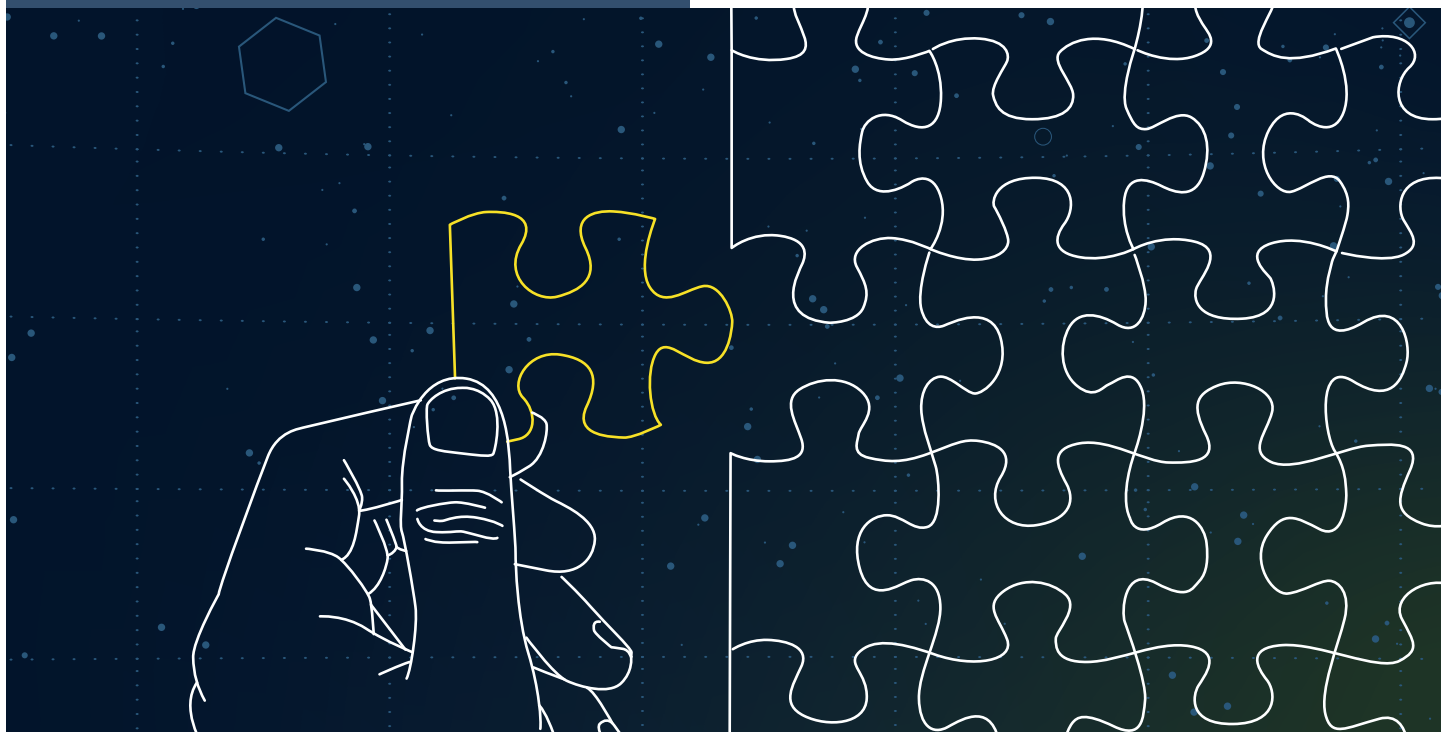
 AFWERX has experienced its share of scrutiny. As with most situations, it is always darkest before the dawn.

Given the exceptional leadership within AFWERX at all levels, the organizational morale was only temporarily deflated at times. The misdeeds of the AFWERX naysayers were quickly exposed, and the organization emerged more committed than ever to achieving the culture change that it was chartered to create. Looking back, this test of will by those radically opposed to change was necessary to solidify the gains AFWERX had made. It put our intentions and methods to the test, and when they were not found wanting, bred confidence in the Air Force as a whole that change is possible, change is coming, and change can be for the better.

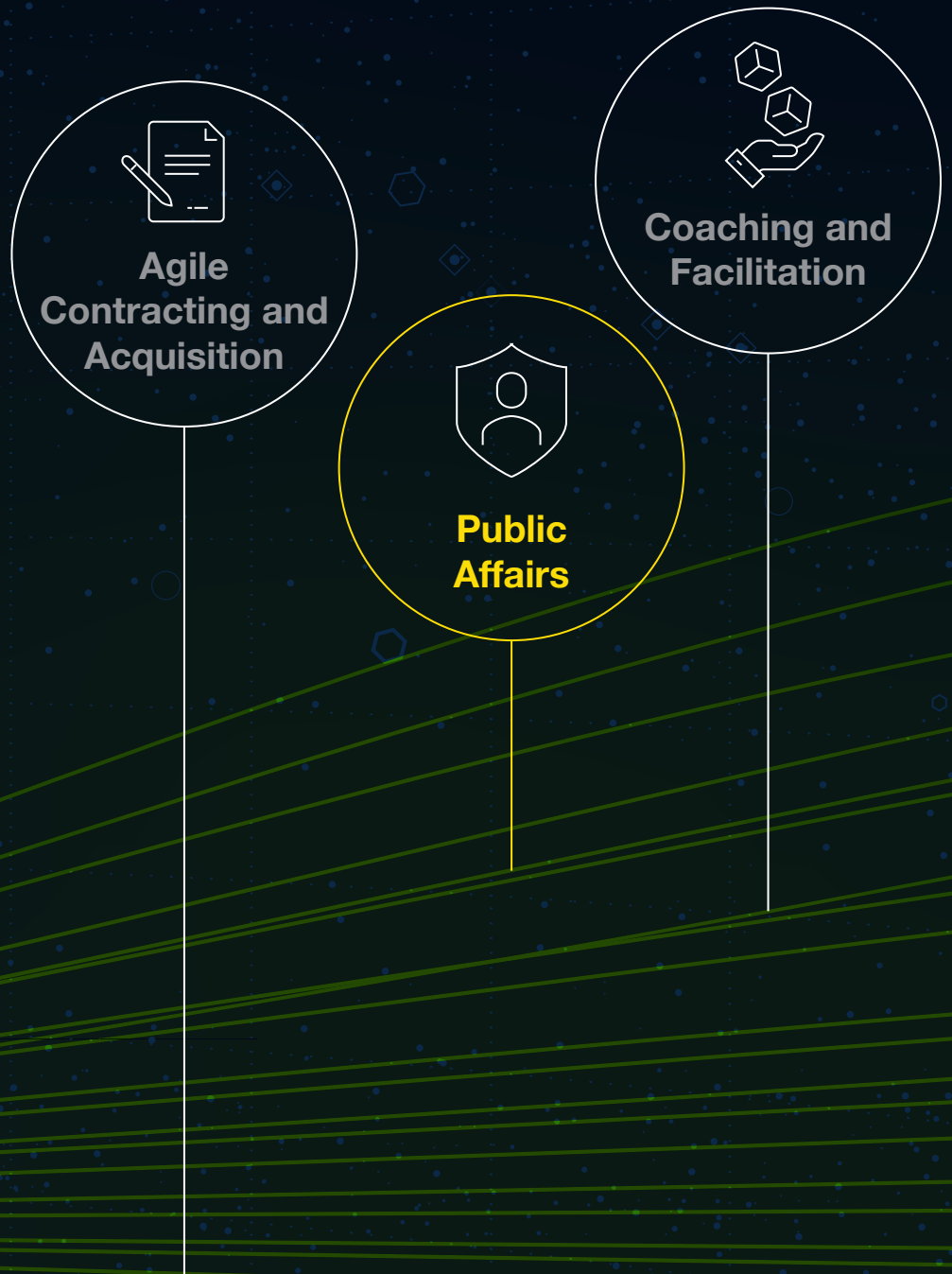"Delivering performance means we will shed outdated management practices and structures while integrating insights from business innovation."

Public Affairs

Agile Contracting and Acquisition

Public Affairs

Coaching and Facilitation

PART 3: TRANSITIONING SOLUTIONS

Public Affairs /// Lt Col Tina "WAG" Parker /// Capt Luis "SnaQ" Cordova /// SSgt Jordyn "Kicks" Fetter /// Bobby "Senator" Mack

> **Because the purpose of business is to create a customer, the business enterprise has two—and only two—basic functions: marketing and innovation. Marketing and innovation produce results; all the rest are costs. Marketing is the distinguishing, unique function of the business.**
>
> PETER DRUCKER

THE PURPOSE OF THE AFWERX MARKETING AND MESSAGING CAPABILITY

To build trust, encourage engagement, and influence culture as we position AFWERX as the go-to source to connect Airmen, industry, and academia in an effort to address Air Force challenges and encourage a culture of innovation.

KEY HIGHLIGHTS

The AFWERX marketing team contributes to the AFWERX objectives of unleashing Airmen Innovation "anytime, anywhere," by creating and leveraging a well-connected, well-engaged, possibility-expanding ecosystem. Simplistically, we organize our efforts into three categories:

Produce Content

Distribute Content

Engage with Audience

There are so many content options that it can be overwhelming to know which ones to focus your efforts on. From a website to blogs, articles, videos, photos, social media platforms, value-added downloads, and email campaigns, the options are endless. They each hold their own value depending on which combination your audience is most likely to respond to, which leads us to the golden rule of communication of all types: "Know your audience."

For AFWERX, our audience is different depending on which capabilities we are promoting. Some capabilities are geared mostly toward Airmen who want to contribute to making the Air Force faster and smarter (or at least make their job or work environment more tolerable or, dare we say, enjoyable), while other capabilities are geared mostly toward small businesses and non-traditional contributors who may not have ever thought of working with the government. We divide our audiences into two overarching categories: Department of Defense and Non-Department of Defense. Each of those audiences has a long list of sub-audiences within

PART 3: TRANSITIONING SOLUTIONS

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Bobby "Senator" Mack

them. Knowing their internal motivations and which communication methods are likely to reach the majority of them is key.

Social media has played a significant role in allowing us to reach both audiences with a mix of information relevant to both. We launched our social media platforms around October 2017. As of November 2019 our followership has grown to:

Facebook: 2592
(From 1570 at the end of Fiscal Year 2018)

Twitter: 2815
(From 1314 at the end of Fiscal Year 2018)

LinkedIn: 5622
From 1635 at the end of Fiscal Year 2019)

Instagram: 1416
(From 1024 at the end of Fiscal Year 2019)

The AFWERX LinkedIn page reached a 13% engagement rate, the highest among other similar Defense Innovation groups, whose engagement rates were roughly 5–9%. According to LinkedIn, the average for a company page is 0.054%. We attribute this positive engagement rate to posting content that adds value to the reader, such as how-to videos or guides, stories and articles that highlight industry and Airmen successes with the capabilities we offer, and by giving credit to our partners for creating innovation pathways with our assistance.

Unfortunately, we do not yet have a content management system in place that provides reliable user engagement analytics, nor do we have a client relationship management system in place that would allow us to accurately track engagement from an email marketing campaign. It has taken more time than expected to implement these platforms. However, we will eventually have them in place. For now, without the proper digital analysis tools, we are limited in being able to tell if a

social media post resulted in someone signing up for an event or if knowledge imparted in an informational video led someone to click a link to our SBIR webpage and apply to SBIR.

YouTube has been a valuable platform since video and visual content is such a key part of communication in the age of technology and 24-hour news cycles. There is so much "noise" competing for everyone's attention every day. Short (three minutes or less), informative, and visually appealing videos are one of the most valuable methods of engaging with our audience. We have found success in focusing on the users and making them the lead characters in the stories we produce or amplify. To engage Airmen or industry partners well, they need to be able to see themselves replicating or expanding upon the success stories they read about their peers.

AFWERX posted 104 public videos and 422 private or unlisted videos to our YouTube channel between December 2017 and October 2019. In that span of time, AFWERX YouTube videos were viewed 29,200+ times. Even while we slept, the AFWERX message was being heard and seen by our audience. However, analytic tracking provided by a content management platform would have enabled us to better determine actual impact from follow-on clicks rather than simply inferring impact based on views.

Articles and stories from public affairs offices across the Air Force as well as mainstream media are important in leveraging our message and lending credibility to the work we are doing. In fiscal year 2019, there were at least 150+ published articles, stories, press releases, blog posts, etc. referencing AFWERX as a contributor to Defense innovation. Of those, 60+ were from Air Force Public Affairs offices who wrote about the innovation efforts of their Airmen and mentioned AFWERX as being a part of their journey. At least as many Airmen innovation articles were published by PA offices that

did not mention AFWERX. We see that as a win for the Air Force regardless of whether we are mentioned. The purpose of AFWERX is to encourage a culture of innovation, and the more stories that are made public of the Airmen as the main characters in the innovation space, the more that culture will grow.

The engagement produced by your outreach leads nowhere if your audience doesn't know where to go to get more information or connect with people who can help them. The website experience is crucial to the success of a program like this. You'll want to lead prospects to your website so they can join your community (become a viable lead) or learn how to apply the various services/capabilities you offer. The key to your website is user experience, user interface, and simplicity. We'll address this more in the following sections. First, let's discuss some of the lessons that we learned while establishing the Marketing and Communication Capability.

LESSONS LEARNED & INSIGHTS SHARED

Establish the groundwork and structure early for how your innovation effort should be supported and positioned in the minds of the audiences.

Across the board, communication, public affairs and marketing each affect the knowledge, attitude, and behavior of an audience. We generate emotions, which lead to thoughts, which lead to actions. It is our job to understand the objectives of the organization, the impact they hope to generate and then create mechanisms to communicate those objectives in a way that produces the desired outcomes.

People are emotional beings. They may understand an objective but unless they are emotionally moved to action, they aren't likely to engage. What emotions do

you want to generate in your audience to encourage them down the path you are laying out? This is the beginning of your communication structure and your overall branding. Branding evokes emotions and people decide to lean into your mission—or away from it—based upon how your "brand" makes them feel. Branding, in its simplified form, presents your organization's "personality." While brand recognition will happen over time as more and more people engage with AFWERX, from the very beginning we needed to define the effect that we wanted to have on our audiences in terms of emotions to make our message stick with them.

As a team, it was initially decided that the AFWERX brand would be established to be bold, modern, and simple (did you notice our logo with the A and E inspired from the movie ALIENS?). Since inception, we have created a brand kit and guidelines to follow so that the AFWERX brand remains recognizable in every form, whether it be within our print materials, digital content, and even the tone by which we communicate through text and social media. There were many possibilities surrounding what the look and feel of AFWERX should be, but it was important for us to decide up front what we wanted people to take away from our brand and create content around that. Policing what has been established and managing the brand for a consistent look and feel is what keeps AFWERX, AFWERX.

Initially, the AFWERX brand was not easy to associate with the Air Force. Fast, agile, and simple are not terms inherently associated with military bureaucracy. In hindsight, this might have been a short-term advantage as it allowed the AFWERX brand to have a stand-alone identity. There was a lot of negativity in the small business community with regard to doing business with any federal government entity due to the government's seemingly endless bureaucratic layers and processes

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involved in reaching contractual agreements. We were fortunate that business leaders who were unsure about doing business with the Air Force were more inclined to know a little more about AFWERX.

This may be just a perception because most of those starting with AFWERX knew that they needed to challenge the status quo. However, this non-association with the Air Force did not produce a long-term advantage. There was some brand confusion within and outside of the Air Force as AFWERX capabilities and brand awareness grew. The AFWERX team did not bring in a communication specialist at the on-set of planning AFWERX, which set us back a bit in the eyes of our users. Integrating a communication team early in the AFWERX planning process, rather than one year into the "experiment," would have ensured consistent messaging and branding and minimized the additional rework and follow-ups required later.

The communication capability could have helped navigate the relationships needed to sustain momentum within the Air Force, especially with the many Public Affairs (PA) members. Fostering more of these kinds of relationships early on would have provided a clear path for sustaining message clarity. The vagueness of AFWERX in the minds of many PA members created a missed opportunity for nearly a year and a half. AFWERX did initially plan to have the AFWERX-Vegas Hub offer corporate marketing support, but that capability was not allowed due to a later contract interpretation.

Marketing and messaging was identified and seen as a need early on, but it was not well supported initially. In December 2018, Bobby and Luis went to the Pentagon and met with various representatives. There was a common theme amongst Air Force communication specialists: "Why should we take AFWERX seriously if AFWERX would not invest in its own full-time communications person?" This kind of questioning was

not easy to hear but it consistently highlighted a view that much of the Air Force institution had of us. They did not take us seriously, and for good reason. We had not established a communication plan and, in their eyes, we didn't even know what our story was…tough to hear, but helpful. What you communicate about yourself becomes who you are in the minds of the public...as long as you can back up what you're saying. However, in the absence of consistent information, people will make up their own stories, which are likely not the stories you want to portray.

SIMPLIFY THE COMPLEXITY OF INFORMATION FOR YOUR AUDIENCE

Marketing takes complex information, simplifies it, and gets it to the people who need it most. This capability ensures that the interface seen by new customers—whether they be an Airmen, business members, or university professors—helps them interact with AFWERX and determines how they will progress into the AFWERX ecosystem.

Marketing fills in the gaps in communication between AFWERX and their key audiences. For example, marketing adjusts public interfaces by streamlining digital pathways, writing interest-catching copy, and producing tutorials. The marketing capability provides direct value to those in the ecosystem by sharing opportunities to get involved, producing content to energize key audiences involved in AFWERX's work, and ensuring the organization's efforts are easy to search and reference.

This simplified approach to relevance works when AFWERX presents to external audiences as well. For example, to make AFWERX's complex system more understandable we worked with Beam for nearly two months, eventually forming the foundation structure that would become the innovation demand and supply

structure...a structure used to explain AFWERX to Congressional staffers, international visitors, and other Air Force leaders. It has also become the structure for this book.

CONSIDER THIS COMMUNICATION AND MARKETING FRAMEWORK AS A STARTING POINT (AS PART OF YOUR BROADER MISSION PLAN)

A good communication plan and marketing strategy permeates the entire organization. It sets the tone for customer interactions and is the common thread that weaves all those interactions together to create an extraordinary customer experience. Without implementing a solid communication plan and marketing strategy from the start, you are left hoping that each team member building the organization has the same understanding and is speaking with one voice. To borrow from age-old wisdom, "Hope is not a strategy."

In AFWERX's case, the people who came together to create this "experiment" from the ground up shared a common interest. They wanted to develop innovation pathways to connect those who had the passion and desire to create positive change with innovative, non-traditional resources that could facilitate those changes quickly. This led to the AFWERX tagline, "Connecting Innovators; Accelerating Results"—although even reaching that moment of communication clarity took nearly five months. Two years later, it has remained our core guidance.

Clearly, the AFWERX team believes in our mission and we see the work we are doing as an opportunity to grow a community of change agents to create an environment where everyone can make a difference and all ideas can be explored to make the Air Force better...or as we like to say, make the Air Force faster and smarter. However,

even with passion and a great product or service, in the absence of a well thought-out and streamlined communication plan and marketing strategy, your best effort will only end up throwing out random bits of information and disjointed content with the hope that something sticks. Remember what we learned about relying on hope?

Creating a communication plan and marketing strategy is not difficult once you understand the structure. Creating one will help everyone in the organization deliver consistent and relevant information in a way that resonates with your audience. You will want to create your communication plan first as it will feed your marketing plan.

In its simplest form, our communication plan used six sections: Background, Communication Objectives, Audiences, Messages & Call to Action, Tactics & Platforms, and Evaluation.

Background: What is the purpose of the organization? What is the current state of the organization and where is the organization trying to go?

Communication Objectives: What are you trying to communicate and why? It is always best when you can link communication objectives to your organization's lines of effort to illustrate the efforts that you are supporting.

Audiences: Who are you communicating to? Be as specific as you can. If your audience has sub-audiences who care about different things, list them out. For instance, sometimes we label Airmen as an audience, but that is a really wide scope. Is the Airman who has been in service for a few years with an idea to make something for his/her work area better going to respond to a different stimulus than a 30-years-in-service senior leader who is concerned with policy and overall service readiness? Really think about your audience. For your messages (coming next) to be effective, you first have

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to know your audience. What do they care about? What problems do they face? How can your organizational network help them solve those problems?

Messaging & Call to Action: What messages do you want each of your audiences to take away from your communication? A message should evoke an emotion, a reason why they should care (gentle reminder of the third section, know your audience). Always ask yourself, "So what?" In order to craft messages that resonate with your audience, you have to know what makes them tick. Examples of messaging to Airmen include:

> Together, we will build the Air Force we need. Join the AFWERX ecosystem.
>
> Help us bring tomorrow's tools to the warfighter today. Share your ideas at https://usaf.ideascalegov.com.
>
> Airmen at every level have a pathway to bring their ideas into reality. Find your path at AFWERX.af.mil.

Some messages will resonate with multiple audiences, some will be more audience specific. It is helpful to have a mix of both for a full messaging toolkit.

Tactics and Platforms: There are many different communication platforms. Once you know who your audience is, figure out which platforms they get their information from and which are best suited to convey your message. Examples of Tactics and Platforms: website, press releases, AF news stories, blogs, monthly newsletter, monthly senior leader update, speaking engagements, IdeaScale, Air Force Portal, Slack workspaces, Medium blog, videos, infographics, ads, email campaigns, and social media (Facebook, Twitter, Instagram, LinkedIn, YouTube).

CONNECT TO A LARGER COMMUNICATION NETWORK—SUCH AS A SERVICE'S PUBLIC AFFAIRS OFFICE—FROM THE VERY BEGINNING

When AFWERX was still a mere idea in 2017, none of the original members had a marketing background. Marketing and communication was seen as an enabling function, but because there was not an initial marketing expert on the founding team they admittedly lacked an experienced voice to offer how the vaguely titled "Public Affairs" capability could be leveraged as an integral part of creating momentum and clarity of purpose for intended participants as well as potential supporters.

Looking back, this is a bit ironic. AFWERX had an opening advantage over most other innovation initiatives because of the support—some might say "hype"—that surrounded it (how many programs include having the Vice President visit during its initial open-to-the-public week?). The opportunity that was created by purposeful messaging and reinforced with intentional redundancy of that message through multiple mediums/platforms and high profile advocates looked a lot like a good marketing plan!

Most people would agree that communicating with internal and external stakeholders is a requirement for any entity to survive. If you have the best product or service in the world, it will not make a difference if no one knows about it. Within a military/government organization, however, the concept of needing a marketing strategy leaves many of these same people bewildered—AFWERX is not selling anything for money, so why would AFWERX need a marketing strategy?

Many people hold this opinion because of a misunderstanding about marketing. Marketing is not about placing an ad in the newspaper or purchasing a TV spot. The purpose of marketing is to build trust with potential customers so that they will want to engage

with you. It is also to continuously create customer experiences with those who have already worked with you and, assuming they have had the value-adding experience that you anticipated, they will continue and encourage others to do the same. Over time, these continuous engagements can create a powerful culture shift in your favor...or against it if you are not holding up your end of the value proposition.

A consistent, effective communication strategy ensures that everyone on the team who interacts with customers or prospects also offers a consistent message to reinforce the trust they have in your organization. These activities create a gravitational pull toward your organization. Likewise, a consistent, effective marketing strategy amplifies that communication through various channels to create revenue for your business/ organization. For AFWERX, part of that revenue is measured by the level of engagement from our various audiences: Airmen, industry and academia.

AFWERX uses marketing to reach Airmen and Air Force leaders for their ideas and problem sets. We then use marketing to find subject matter experts to define the problem statement for industry. Lastly, we use marketing to communicate that problem statement to an entire nation's worth of potential solution providers to ensure that we have the best possible solutions for our warfighter. All of this happens through AFWERX marketing in the various forms of email, print brochures, social media, press releases, photo and video content, and more as we engage innovators.

We see the direct results of our communication effort with every successful solution that is provided, and we also see an auxiliary effect taking place through the culture change that occurs with those successes. Airmen start to realize that they have a voice and that they can have an influence on something bigger than

just their day-to-day job. AFWERX marketing is more than just a way to communicate. It is a way to inspire, engage, and enable innovators to achieve greatness and ultimately contribute towards our national security.

Generally, the lessons learned can be categorized as "invest in a communication person early" and "integrate the communication/marketing lead as part of the decision making team."

CONCLUDING THOUGHT

Marketing and Communication is about connecting people with information that affects their behavior, attitude, and actions in an effort to achieve a certain objective.

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"Because the purpose of business is to create a customer, the business enterprise has two—and only two—basic functions: marketing and innovation. Marketing and innovation produce results; all the rest are costs. Marketing is the distinguishing, unique function of the business."

Coaching and Facilitation

Agile Contracting and Acquisition

Public Affairs

Coaching and Facilitation

> "You see, in life, lots of people know what to do, but few people actually do what they know. Knowing is not enough! You must take action.
>
> TONY ROBBINS

THE PURPOSE OF THE AFWERX COACHING AND FACILITATION CAPABILITY

To support our intrapreneurs and other project stakeholders. The art of coaching and facilitation is not to do the work but to check-in, to encourage, to provoke, to challenge, and let the team know that there are people who are on their side and want the project to be a success. In any given week the very small and passionate AFWERX team is working with thousands of people, supporting hundreds of projects.

LESSONS LEARNED & INSIGHTS SHARED

Ensure you have a culture within your team to act as a coach rather than a consultant to achieve exponential return on your time

The old adage remains relevant—you can give a man a fish and feed him for a day, or teach a man to fish and you feed him for a lifetime. To give an example, Tony Perez and his team of two full-time people support 60 Spark Cells (and growing to 80 by the end of 2020 we predict) that themselves influence over 400,000 people across the bases. If Tony decided he wanted to control everything and have all decisions come through him, then the progress of the Spark Cells and their projects would

grind to a halt. A similar situation exists within all our capabilities, from Spark Tank to AF Ventures to AFWERX Challenge. There is, of course, a fine balance between doing too little and doing too much to support the projects that AFWERX is involved in. We are always learning new ways to support while still maintaining enough visibility of what is going on to see where and when we may need to step in to provide additional support.

KEEPING PEOPLE MOTIVATED TO DELIVER ON THE PROJECT OUTCOMES

Our coaching skill comes to the forefront when we check-in on an intrapreneur who is struggling to execute their project and are losing hope that the outcomes will be achieved. In this context, we are there to provide support. By asking the right questions, we help the intrapreneur stay motivated on the goals of the project and the outcome they want to achieve and remind them of the consequences of the project not being successful. We ask questions about the resources they might need in order to deliver project success.

We empathize that it is difficult to be an intrapreneur because we are intrapreneurs and entrepreneurs ourselves. We can certainly mentor, coach and support

them through those days and weeks where it seems too hard and there is no traction.

For AFWERX, there is no success unless the projects we support yield positive impact to the warfighter. We know this may require many weeks and months of effort with lots of obstacles to overcome. Our role is to support the intrapreneur and the project team to stay focused on the mission and leverage the resources of the Air Force to deliver project success no matter how many times we need to pivot to accomplish this.

OVERCOMING OBSTACLES

By staying in contact with the project teams and the intrapreneur, we often discover obstacles large and small that need to be overcome. In these situations, we can leverage all of our team's capabilities, including connections with senior leaders and the Major Commands, to get guidance and make sure the appropriate people and resources are used to support the project. Again we do this in a coaching capacity rather than acting as a consultant and we stay true to our own values. This is one of the ways that we can help to transition solutions.

DEALING WITH THE GRIEF OF PROJECT FAILURE

Our role is also to support the intrapreneur and the project team to accept that the project is not achieving the outcomes they expected and to accept that they need to let it go. Our aim is to fail cheaply and quickly so we can harvest the learning. Sometimes there may be an alternate pathway to achieve the desired outcome and sometimes we all must accept that the solution to the problem we want to solve is out of our reach at the present time, for any number of reasons. In these

moments, we support the intrapreneur and the project team to accept the decision and deal with all the stages of grief that they will be going through so that they can emerge from the experience wiser and motivated to continue to drive change.

"You see, in life, lots of people know what to do, but few people actually do what they know. Knowing is not enough! You must take action."

AFWERX RESPONSE TO COVID-19
When Given Lemons, Make Lemonade

AFWERX

> **Coronavirus. Social distancing. Travel restrictions. The new non-normal.**

These were just a few of the terms that the world began using as the Coronavirus 2019 (COVID-19) spread across the globe. The impact upon societies rippled into everyone's lives and work.

For AFWERX, the first COVID-19 impact upon our innovation mission was the cancellation of the South by Southwest (SXSW) Conference in Austin, Texas. SXSW was going to be a major event for us. We were going to hold a Collider Event that would culminate with an announcement of nearly half a billion dollars in private industry investment going towards major Air Force capabilities of interest. There was also going to be the public launch of the Agility Prime initiative to accelerate the "flying cars" or "orbs" industry.

What do you do when an innovation effort is at risk because of factors beyond your control? For AFWERX, we pivoted. We quickly transitioned from live, in-person events to virtual events. Along the way, we learned that there were many advantages to be found within a virtual experience, including:

➦ Reaching a larger audience
➦ Not needing to cram all events into a limited space or time
➦ Setting a world record for hosting 188 simultaneous virtual meeting rooms at one time

AFWERX had many other planned workshops and events that we needed to pivot to virtual events quickly, leveraging commercial video conferencing, live streaming, and virtual ideation tools. In addition, AFWERX was getting daily requests from across the Air Force asking for support to run webinars, virtual workshops, etc.

What follows are some of the highlights of the AFWERX COVID responses. We hope that this offers a future reference on how to maintain innovation momentum though virtual transitions from in-person events.

USAF VIRTUAL PITCH BOWL & SBIR VIRTUAL COLLIDER EVENTS

USAF had planned a unique event—The Pitch Bowl—for the March 2020 SXSW gathering. The Air Force had already hosted a slew of pitch events, beginning with the New York event in early 2019. The Pitch Bowl was to be the "Super Bowl of Pitch Days" according to Dr. Will Roper, the USAF Assistant Secretary for Acquisition, Technology, and Logistics. Normally, an Air Force Pitch Day focuses on a particular technology portfolio and offers entrepreneurs with promising technology some form of early-stage development contracts. The Pitch Bowl was going to offer the next step: a path to greater

research and development funding (contracts of at least $3 million) so that the commercial market could create greater agility and options for the Air Force's inventory of capabilities.

Unfortunately, just two weeks before the 300,000 person SXSW event was due to open, it was cancelled by the City of Austin.

The AFWERX team immediately decided to keep the original dates for the event and pivot to a virtual format. This was a scramble! A lot of long days were needed to decide how best to run the event virtually, and our team was spread across the three time zones from Las Vegas to Austin to DC.

We integrated multiple technologies in order to create a website page for attendees to see the event's schedule, livestream, and quickly click on links to participate in breakout rooms and panel discussions. We also included a chat feature so that viewers could ask questions. YouTube Live was the streaming platform and Webex was used as the video conferencing technology.

The event was streamed live over 2 days, and it included a fireside chat with Secretary of the Air Force Barrett and Dr. Roper. There were also a multitude of keynote speakers and panel sessions that participants could join. By the end of the event, the number of attendees was much greater than would have been achieved at the in-person event. Instead of the 800 people we expected in-person, over 5,000 people attended virtually! It was a huge success.

Since SXSW, the AFWERX team has supported multiple successful virtual Collider events. There has not been a slow down in the effectiveness of the team to engage with industry and get companies on contract.

UNITE AND FIGHT: THE COVID-19 CRISIS RESPONSE TEAM AND THE DEPARTMENT OF THE AIR FORCE COVID-19 ACQUISITION TASK FORCE (DAF ACT)

Building from the successes of the virtual events, Dr. Roper asked AFVentures—AFWERX's "acquisition" arm—to lead the Air Force's COVID-19 Crisis Response Team. The pandemic had a direct impact on the economic health of small businesses, crippling private capital markets and resulting in historic unemployment numbers. In turn, many innovative small businesses turned to the DoD for work, offering innovative technologies that could help them overcome COVID-19 related issues. Given their prior work with thousands of small businesses, Dr. Roper asked AFVentures to lead the Air Force's Crisis Response Team (CRT). He charged them with both finding opportunities for innovative small businesses and creating programs that would help catalyze and scale solutions to help overcome COVID-19.

Soon, this became an all of AFWERX response. The CRT quickly stood up a "front door" for everyone who was interested in, and available to assist in, the COVID-19 response mission. This "front door" opened to both companies who had innovative solutions to COVID-19 related needs and government personnel interested in volunteering. By 1 July, 2020, the CRT was staffed with 182 individuals, with over 3,600 companies registering candidate capabilities.

Given the quick success of the CRT, the AFWERX team was transitioned to the DAF's Acquisition Task Force as one of four leading elements. On the task force, the CRT was re-labeled "LOE 4, RAPID". Under the DAF ACT, LOE 4's influence expanded, soon becoming the "front door" for all of DoD, not just the Air Force. In this capacity, AFWERX PA, with branding help from theDifference, started the "Unite and Fight"

campaign, which swept like wildfire. AFWERX personnel hosted AMA webinars for companies, non-profits, universities, etc., twice a week to help companies identify opportunities for how their capabilities might assist in the nation's fight against COVID-19. Attendance often exceeding the maximum available on Zoom (500 companies). It was so successful, that the "Unite and Fight" campaign soon became the Nation's "front door" for innovative ideas.

The LOE 4 AFWERX team accomplished a number of incredible feats during this time. They worked directly with FEMA to evaluate and support the award of hundreds of proposals, totaling $645M. They interfaced with senior DoD medical leadership, advocating for, then writing, the initial requirement for contact tracing. They generated dozens of program plans, a few of which received funding and directly impacted the Air Force mission. This is particularly true of AF RAMP (Rapid Agile Manufacturing Platform), which produced ~100,000 pieces of PPE using small batch, non-traditional manufacturers. Lastly, they generated the strongest interest in the history of the Air Force's SBIR program, resulting in 641 Phase II proposals and assisting in the award of over $375M directly to hundreds of small businesses during the pandemic.

AGILITY PRIME VIRTUAL LAUNCH EVENT

Agility Prime—an initiative to pursue distributed logistics using flying orbs ("flying cars!")—was originally going to be launched at SXSW as a networking event where we were anticipating a few hundred people to listen to a keynote speaker, and then offer a panel discussion to launch the initiative. This would be a non-traditional program that would seek to accelerate the commercial market development of advanced, air mobility vehicles.

With the cancellation of SXSW, the Agility Prime (AP) team regrouped and made a decision to pivot to a virtual event. The team worked with the AFWERX-Vegas Hub and the team at theDifference to develop a new schedule, brand the initiative, and build the infrastructure for the event. The AP team also worked with the software development team at Platform One to build the Agility Prime site that would host the event.

Once again, we needed to integrate multiple technologies in order to accomplish the event, including Zoom meetings, Zoom breakout rooms, Zoom webinar, YouTube Live, Pollster, and more. We ran innovative networking sessions, and along the way broke the world record for most simultaneous zoom breakout rooms (188). We hosted 18 keynote speakers, including the Secretary of the Air Force, the Chief of Staff of the Air Force as well as industry leaders.

In addition, we built our own virtual tradeshow platform to host 55 companies involved in the industry. Our virtual platform provided connections between government stakeholders and the flying car industry. On the final day of the event, attendees were able to engage with the companies and make connections.

Over the course of the event, we attracted 4534 registered attendees and 67,000 views of the event. The event caught people's attention on social with 131,373 impressions on our posts. This engagement far exceeded the attendance and impact we would have had from a physical, in-person event at SXSW.

SPARK CELLS COVID-19 RESPONSE

Spark Cells played a critical role in supporting the Department of Defense and Air Force response to COVID-19 pandemic. These base-level innovation units are part of a broad network of semi-autonomous cells

whose primary purpose is to independently solve local problem sets. In this role they were uniquely positioned to provide an impact because of in-place resources, existing relationships and non-traditional problem solving experience.

From the very beginning of the pandemic the lack of available equipment was identified as a looming threat. To meet the supply and demand problem, Spark Cells like Eglin AFB repurposed existing 3D printing capabilities to mass produce critical items in the form of face shields, masks, and door handles. This non-medical equipment was used by on-base mission essential personnel, and preserved access of limited medical grade resources for those that needed it most. Spark Cells also shared these 3D design files across the ecosystem allowing equipment to be printed at bases around the world and increase the global Air Force response capability.

Existing and new Spark relationships also created an impact during the response. Spark Cells worked closely with their local communities to determine needs and provide the locally produced PPE and logistics support. The Robins AFB and other Spark Cells also played a key role in brokering the donation of 10,000 gallons of hand sanitizer from the Exxon Mobil corporation. They then coordinated internally to identify the greatest shortages and distributed this critical resource to bases from Georgia to North Dakota. Had these relationships not been in place prior to the pandemic, these responses would have been significantly slowed or otherwise impossible.

Finally, the unique problem solving experience of Spark members created a capability that quickly evaluated a large number of commercial offerings and identified the most impactful COVID-19 solutions. In response to the extraordinary need for solutions, the Air Force released an out of cycle Small Business Innovation

Research (SBIR) topic to specifically contract with unique commercial offerings. Over 600 small businesses, the largest to date, submitted proposals that were quickly evaluated by volunteer Spark Cell members with unique experience. The solutions are now in the pipeline to help solve the multiple challenges created by COVID-19.

In many ways, the COVID-19 pandemic served as validation for the very existence of Spark Cells. There is no Air Force regulation or directive for bases to create Spark Cells, and any response provided by its members or in leveraging their resources was strictly voluntary. This network of independent innovation units produced a surge capacity that rose to an unforeseen challenge and provided an exponential return on the Air Force's investment in them. Spark Cells created a response capacity within the Air Force, and they stand ready to solve future problems both locally and around the world.

AFWERX CHALLENGE RESPONSE DURING SHELTER IN PLACE

During the shelter-in-place and reduced-travel phase of the pandemic, we have maintained momentum without any date slippages on 16 Challenges in various stages of development. We have run our scoping workshops, challenge definition workshops, open-source crowdsourcing, promotional outreach, evaluations of over 2,000 submissions, showcase events and demonstration events. Like the sword that is tested, tempered, and strengthened by fire, the heat from the urgency of the moment drove us to experiment virtually with tools that we had never before used. In many ways, we became even more efficient and effective during this time.

AFWERX FUSION PIVOT

The AFWERX flagship event is called AFWERX Fusion. It is held annually, in June or July of each year. In 2019 it attracted over 1,200 people and 100 companies focused on Multi-Domain Operations, and that name of that focus area has also evolved to Joint All Domain Command and Control (JADC2). The 2020 event is focused on the "Base of the Future" and will be used to support the rebuild of Tyndall AFB, which was devastated by Hurricane Michael. Originally, Fusion 2020 was planned for June 2020 at the Las Vegas Convention Center, as a 3,000+ in-person event. In March, we pivoted this to a September, in-person event at the UNLV Thomas & Mac convention center. Then, when it was looking unlikely that the event could be an in-person event in the summer, we pivoted again to create a virtual event for July. For each new iteration of Fusion, we had to receive conference approval at the Pentagon level, as well as redesign layouts, schedules, speakers line-ups, and more. Fusion 2020 has been a great case study in the test of character required of innovators, especially with the character trait of Persistence.

The team maintained its focus and, with Lisa Hendricks as the event director, has successfully delivered an amazing event, leveraging all of the lessons learned during our three months of COVID-driven, virtual events. Hundreds of DoD subject matter experts evaluated over 1,500 submissions for Fusion, and Fusion showcased over 300 of those companies while also offering engaging content, interactive panels, workshops, and more for the audience.

VIRTUAL TOOLS, WORKSHOPS AND EVENTS

The impact of the travel restrictions on the AFWERX team was huge, given that so much of our innovation work had been performed using in-person meetings, workshops and events. As we quickly pivoted, the question we asked ourselves was "How could we be even more effective virtually than we have been up until now?" This inspired us to experiment with virtual tools that we could utilize in our work with Airmen, including:

Zoom, Webex, & Microsoft teams: to run virtual workshops

Miro, Mural: to allow ideation through virtual whiteboards

Slack & Mattermost: to allow instant messaging during events and workshops

YouTube & Vimeo: for the live streaming events to a global audience

Google Suite: Productivity and real time collaboration

Microsoft Teams: Chat capability open to all government users.

Having a tool set that allows for real time collaboration and some of them without CAC access that can handle FOUO/PII is critical for the success of our future.

To get a sense of how important this is, here is the blueprint for our Virtual Challenge Definition Workshops:

We host multiple scoping calls to develop the agenda for the workshop as well as select the participants

We hold a "tech check" with participants prior to the workshop. We use this time to ensure that all technology is accessible, including Zoom meeting microphones, video cameras, chat features and breakout rooms. The breakout rooms are a distinctive feature of Zoom that is currently not offered by the other video conferencing tools. We also test Miro, which allows people to mimic designing on a white board by offering virtual sticky notes, the clustering of ideas, voting on topics, creating

action plans, making requirements lists, and more. We test to ensure that the participants can access the tools and comfortably use them.

Our in-person workshops usually occur over 2 days, and last 8 hours per day. One of the benefits of the virtual workshop is that we can break the event into smaller components and run it over multiple days. This creates less of a time commitment per day for participants, which reduces the stress of being away from their home office for two consecutive days. This allows participants to focus more easily when they are engaged with the workshop.

We bring all of the participants together for a 'plenary' session and then break them into groups and move them to separate breakout rooms for discussions in smaller groups. We then bring them back together to discuss their key takeaways.

As an example of how this plays out, one workshop occurred across three days, four hours a day, with 80+ participants. There were 10 breakout rooms with 8 people per room and one AFWERX facilitator in each room. There was also a main facilitator of the workshop who acted as the event director and was also responsible for the music and bringing people into the plenary gatherings and moving participants into breakout rooms.

We have learned a lot from these experiences which helps us continually improve how we run virtual workshops and even hybrid workshops and events.

Here are some examples of workshops that we have conducted during the shelter-in-place and travel restriction period of March - June 2020:

Supporting the Space Force innovation planning through a 40+ person, 4-day virtual workshop, using Miro as the ideation tool and Zoom with breakout rooms.

Supporting the MAJCOM Innovation Directorates with a 3-day, 30+ person virtual workshop using Mural as an ideation tool and Zoom with breakout rooms.

Running a 3-day design sprint with the AF Recruiting Service to reimagine the officer accession process.

Virtual Challenge Definition workshops with two of our projects and 80+ participants.

AFRL Tech Transfer workshop with a group of 30+ diverse participants from USAF, industry and academia, in order to improve the tech transfer process.

MARKETING AND COMMUNICATIONS

While AFWERX was pivoting, the Marketing team got to work highlighting the efforts and Airmen behind the amazing work across the U.S. Air Force through Air Force channels and media.

This included:

Highlighting Spark Cells who created a resource for masks and additional PPE outside of the normal supply chain.

Reaching out to Base Public Affairs shops to bring awareness to COVID-19 efforts (if they weren't already aware) and sharing AFWERX messaging.

Showcasing how bases were collaborating with local businesses and communities.

As efforts continue and evolve, the team will be sure to continue highlighting specific COVID-19 efforts and pitching to local and national media outlets.

PARTING THOUGHTS
The Battle Space of
Hearts, Minds, and Ideas

AFWERX

> " I have the happiness to know that it is a
> rising, and not a setting, sun. "
>
> BENJAMIN FRANKLIN

At the conclusion of the drafting of the U.S. Constitution, Benjamin Franklin remarked about a sun that was molded onto the back of President Washington's chair. That sun had seemed to be setting during times of Constitutional convention struggle, and rising during times of progress. Dr. Franklin had wondered many times which direction that sun would ultimately be headed...

Have you ever wondered, "Why does the United States celebrate the 4th of July, 1776?" We could very easily have celebrated 19 October 1781, when the colonies and the French achieved victory over General Cornwallis and secured U.S. independence. Alternatively, we could have celebrated our nation's birthday on 3 September 1783, when the Treaty of Paris "officially" recognized us as the United States of America.

Yet our predecessors chose the 4th of July.

How telling! Our Nation celebrates its heritage based upon the moral idea of an individual's worth and the subsequent conclusion that governments should receive their powers from the consent of their governed individuals of worth. That idea included a self-evident Truth that we possessed unalienable rights to "Life, Liberty, and the Pursuit of Happiness." Many would risk their lives and fortune (and many would lose both)

to create a nation that has offered a unique innovation space within world history.

The Founders were not perfect. Indeed, some of their flaws would create conditions for a great Civil War during our young Nation's first century. Yet despite our predecessors flaws, within 200 years their system of "startup" colonies would start small, fail fast (and often), learn quickly, scale bigger, and win big (including during two World Wars) to become a global superpower, a moon lander, and a prosperity leader. I like to think of AFWERX's Founding Years in a similar manner. We may have made mistakes, but collectively we and the Coalition of the Willing have answered a calling, and tens of thousands of Airmen, Entrepreneurs, Venture Capitalists, Academics, and Industry-minded talent have joined us in campaigns to make our Air Force and our Nation more agile and capable. We could not have accomplished our mission without a Coalition of the Willing who are too numerous to mention individually, but to them we offer our collective gratitude. Thank you!

One final Insight Shared: The ideas forming AFWERX were similar to those that formed the U.S. Constitution—create a framework of possibilities capable of evolving and uniting efforts that produce reality-altering impacts.

May that sun continue to rise...

"I have the happiness to know that it is a rising, and not a setting, sun."